THE MAGAZINE

OF

Useful and Entertaining Knowledge.

"Get wisdom: and, with all thy getting, get understanding."

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EDUCATION.

PRACTICAL REMARKS.

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The great and still increasing interest which is felt at the present day, in the subject of education, will furnish, it is presumed, a sufficient apology for inviting the attention of the patrons of the 'Magazine of Useful and Entertaining Knowledge,' to some remarks of a practical nature, adapted to what is believed to be the present state of public sentiment and feeling on this important topic. The views and considerations contained in this communication, are the results of some experience in the business of instruction, and are submitted in the hope that they may contribute, in some small degree at least, to fix the attention of the public still more strongly and directly upon the subject, and with a design to throw out some hints and observations that may influence them to give the education of the rising generation a greater share of their solicitude and active interest than it has heretofore received. But it may be asked whether any additional inducements can be necessary for this purpose, beyond what are manifestly involved in the intrinsic importance of the object? Is the right instruction of those who will very soon be taking the places of the leading and efficient

members of the present generation, an enterprise in which an enlightened and christian community will engage with reluctance? Can there be need of extraneous motives to induce them to embark in it? True it is that the benefits arising from expenditures in this concern do not appear in the shape of dollars and cents, and therefore it presents but few attractions to such as have no other mode of estimating advantages, and of calculating profits; but to those who are parents, this objection is of little weight. To them the subject is fraught with motives and inducements to engage in it, of the most interesting and momentous character, whether we regard considerations of duty, or feelings of personal gratification. The love of our offspring may justly be considered as only a second edition of self-love; and like other second editions it is usually so much enlarged and improved as to lead us to make much greater efforts, and to submit to much greater privations and sacrifices for its gratification, than it could have done in its original form. Most parents, it is well known, feel more solicitude for the respectability and welfare of their children, than for their own, and are much more anxious to discharge their duty faithfully to them, than to secure personal advantages to themselves. This is a wise and happy constitution of our nature, and is one of the strongest ties that hold society together. It is one of those first principles implanted in the human heart by the hand of our Creator, to teach us that we are social beings; that we are not born for ourselves alone, and that we cannot live to ourselves alone, without failing to accomplish the proper end of our existence. The very condition of human society is, that each is bound to all, and all to each, for mutual good. The precepts of religion, too, require that we should do good to all men as we have opportunity. Who, then, can withhold his aid from the great work of meliorating the condition of mankind? who can stand aloof from all the splendid and magnificent enterprises of benevolence that so strongly characterise the age in which we live, and wrapping himself up in his own selfish individuality, look with cold indifference on the vast and expansive movements that are making in the moral and religious world, all calculated and intended to diffuse the blessings of knowledge, of virtue, of religion and liberty through every land,

without forfeiting all claim to the rewards of social virtue, and dying in debt to mankind? Few, it is to be hoped, of this description can be found in the community to which we belong; but in reference to the general subject, we may justly and pertinently adopt the strong and expressive language of the poet, and say,

"If such there breathe, go, mark him well;
For him no minstrel raptures swell:
High though his titles, proud his name,
Boundless his wealth as wish can claim—
Despite those titles, power, and pelf,
The wretch, concentred all in self,
Living, shall forfeit fair renown,
And doubly dying, shall go down
To the vile dust, from whence he sprung,
Unwept, unhonored, and unsung."

The discharge of this inherent and pervading duty can no where be commenced so favorably as well as naturally by parents, as in the persons of their own beloved offspring. Starting from this point, as from a centre, the circle of their benevolent feelings and exertions will continually and spontaneously enlarge and widen, till it embraces within its broad circumference the whole family of mankind. Equally obvious is it that the first step in this work of social and parental duty towards the rising generation, must necessarily be taken in the morning of their days. That season of life is by far the most favorable for incipient operations. The young and tender shoot is easily made to bend and to assume whatever shape or direction may be desired; but the full grown tree will scarcely yield to any force that can be applied to it, and will ordinarily break before it will bend.

From this consideration it becomes exceedingly important that a right direction be given to the youthful faculties, as soon as they begin to be developed. The knowledge we possess of the nature and destiny of man, leaves no doubt upon the mind that these faculties will continue to enlarge forever, and to make endless advances in the acquisition of knowledge. The process of education, therefore, may be compared to a line of unlimited extent, the commencement only of which is in our view, while the grand and ultimate object to which it leads, like one of the fixed stars in the

firmament, is visible indeed to the mental eye, but placed at an unmeasured distance from us; and as in drawing a line from any part of the earth's surface to such a star, the variation even of a hair's breadth from the true direction, at the point of departure, would carry the line millions of miles aside from its object, so a very slight deviation from the right course, at the commencement of the process of education, may cause a total failure of attaining its chief end and object, and instead of bringing the subject of it to the desired haven of honor, of virtue, and of happiness, may plunge him into the gulf of destruction and misery. There is no danger, then, that the work of education will be begun too early, or that too much care will be bestowed upon a subject so vitally important. It is a part of our religion to train up a child in the way he should go; and in addition to this high and authoritative injunction of Holy Writ, remember, ye who are parents, that your children are destined, in the ordinary course of nature, to sustain relations of incalculable importance, both to the community to which they may immediately belong; to their country at large; to the present and future generations of men; to the Church of our common Lord and Saviour, and even to eternity itself; and that these relations devolve responsibilities upon you, of the most solemn and commanding import—responsibilities which must be fully and directly met—which no artifice can shun, no sophistry evade—responsibilities that are incorporated into your very constitution, and attach themselves to you by an irreversible law of your nature.

These, surely, are considerations sufficiently momentous to rouse the most careless and indifferent to action. Know, then, that for every son whom God has committed to your charge, you owe to those who may hereafter reside in his immediate vicinity—so far as your instructions, guidance, example and influence extend—a quiet and peaceable neighbor, a kind and liberal friend, and a ready helper in every time of need; to his country, an active, intelligent, well-informed and useful citizen, capable of sustaining with credit and reputation any office of honor or trust in the gift of his fellow-citizens; to the present and future generations, so far as he shall become known to them, a bright and blameless example for their imitation; to the visible church, a pious, engaged and zealous

christian, an active and steady co-operator in all her enterprises of benevolence and charity; and, to crown the whole, an heir of glory to the kingdom of heaven. In view of these high responsibilities, you may well exclaim, "Who is sufficient for these things," and how is this more than Herculean labor to be accomplished? The answer is ready, direct and conclusive: It is by a judicious and well directed course of education, commenced as early as the movements of the intellect can be discovered, and continued till the mental powers are so far expanded, and the judgment so far ripened and matured as to enable the subject to engage in some of the active pursuits of life. A steady, undeviating adherence to this course will effectually accomplish the great and important work, so far as human means can ever accomplish it. In any event the parent who pursues it will be exonerated from all the blame and criminality that may subsequently be incurred, by deviations from the paths of rectitude, on the part of an undutiful and ungrateful son.

With respect to the general plan, and the particular conduct of such an education, much may undoubtedly be said. The present age has so often been denominated "an age of improvement," and its claim to that honorable and flattering appellation, in many particulars, rests on so solid a foundation, that it requires no small degree of moral courage to question the propriety of its application, in any case. There is a chord in the human heart that vibrates in perfect unison with the accents of praise, and responds in tones of sweetest harmony to the voice of commendation. Individual self-love, likewise, is so easily, and at the same time so covertly gratified, when thus wrapped up in the indiscriminate praise of a whole generation of men, that he who denies the strict justice of the designation above mentioned, in any particular, exposes himself to the charge of uncharitableness, and even downright moroseness of disposition. Indeed, the astonishing improvements that have in fact been made in the useful arts, and in practical science; the magnificent monuments of human skill and genius, as exhibited in the various departments of natural philosophy applied to the common and ordinary operations of life, and the vast and varied schemes in agitation for the improvement of the civil, the physical,

the moral and intellectual condition of the world, may confidently and safely be appealed to, as undeniable proofs of the active benevolence and the successful enterprise of the present day. But notwithstanding all this, in regard to the subject of education, we must confess that "we are not the people, and that wisdom will not die with us." The public attention has, indeed, within a few years past, been very much awakened on the subject, and many changes and some improvements have been made in the mode of imparting instruction: yet the great variety of conflicting opinions respecting the relative value and importance of particular branches of study, to be met with in publications professedly devoted to the cause of school instruction, shows conclusively that no system has yet been devised that meets the approbation of all those who are engaged in that employment, or of the public at large. A wide field for speculation is opened by the present unsettled state of the subject, and it would hardly be in accordance with the general course of human affairs, should not much false reasoning and groundless theory be found amongthe multitude of publications, on a theme so prolific, with which the press is daily teeming. It has been happily observed, however, that "from the collision of sentiment the truth is elicited," and there is certainly reason to hope and believe that the attention which has been excited, and the efforts that are making, will eventually result in some valuable and permanent improvements in this highly important public concern. The movements already made have had the effect to agitate the waters of the fountain of learning, and we wait in the confident expectation that the purifying process is rapidly going on, and that streams, rendered more clear and sweet, more healthful and fertilising by the very agitation which the fountain has undergone, will soon issue from it, to cheer and gladden the face of our community, to raise and dignify its literary character, and spread their benign and happy influences through every part of the body politic. Much, also, may doubtless be expected from the numerous associations and meetings among the friends of education, of which we hear in various parts of our country, aided as their deliberations have been, and will continue to be, by the views and opinions of learned professors, and the practical wisdom of experienced teachers.

This we consider to be the right shape for the subject to assume, and the proper attitude in which it should be met, discussed and settled.

Our own views of the proper end and object of education have already been sufficiently indicated by the remarks we have made. It is to fit men for existence,—for the whole of their existence,—not merely for the short and uncertain term of human life, but also for that never ending state which awaits them beyond the grave. It would be absurdly unwise and irrational to grasp exclusively at that good whose usefulness is bounden by the narrow limits of an earthly existence, however specious and attractive it may be in appearance, to the neglect of that whose influence reaches forward into futurity, and will be felt through interminable ages. A primary regard must unquestionably be had to the concerns of this life, in every well devised system of education, because its first operations will necessarily be conversant with them. The subjects of it should by all means be properly qualified to live as men, among men, and be ready to meet every emergency, and to discharge every duty that may result from that relation; still their education should be conducted upon principles in entire subserviency to the cause of virtue and sound morals. Without these fundamental principles, as a balance to the mind, knowledge will only serve to puff up its possessor, and engender conceit and arrogance in his bosom. He will be like a ship, with a full lading upon its decks, but no ballast in the hold; like a mariner with a strong wind and rapid current, but neither chart nor compass to direct his course. A deep and habitual reverence for the name and attributes of the Supreme Being; an undeviating adherence to truth in all our communications; the constant practice of the law of kindness, as well as an invariable regard for the principles of integrity and honor, in all our dealings; and an unceasing effort to attain higher and still higher degrees of moral excellence, by making the Divine Founder of our holy religion our pattern and examplar, are duties common to all men in every state and condition of life, and cannot be too early or too frequently, or too earnestly inculcated upon the young and tender mind. They form the only basis on which an education and a character truly useful

and valuable can rest; and when universally diffused and united with extensive acquisitions in the various deparments of literature and science, they will infallibly secure that virtue and intelligence in our citizens, which constitute the "ark of safety" to the political compact under which we live. They are, in truth, the foundation stones on which the main pillars of the fabric rest; and if they are neglected, or loosely laid, that building cannot stand; it must and will inevitably crumble to the dust. We are not ignorant that in some parts of our country there is a morbid sensitiveness on the subject of teaching any thing that bears even the semblance of religion in schools and seminaries of learning. Even the Bible has, in some places, been banished from the schoolhouse, as an unsuitable book for children to read or to hear read. That a school is not the proper place to inculcate sectarian principles, or to disseminate the peculiar tenets of any religious party, is readily conceded, but that children in such institutions should not be taught to reverence the Deity; to obey their Parents; to speak the truth; to deal kindly and justly; in a word, to love and practice virtue for virtues sake, is a point that will not be conceded to any human authority whatever. A contrary practice would present an exemplification, as exact as it would be lamentable, of that maxim of Divine wisdom, that the children of this world are in their generation wiser than the children of light. The deluded votaries of heathenish superstition employ all the means and resort to every artifice which human ingenuity can devise, in order to incorporate a false religion into almost every act and circumstance of life. A most minute and rigorous course of training is adopted, from early infancy, to secure an adherance to their senseless ceremonies, and to inspire a superstitious dread of the slightest omission or deviation from the established ritual; so that a Hindoo would cut off his right hand, or pluck out his right eye, rather than forego his appointed ablutions, or fail of one jot or one tittle of his prescribed, though merely formal and heartless, devotions to some modern Moloch or Belial; and shall we be scarcely less assiduous in our endeavours to prevent the principles of the only true religion under heaven from taking up their abode in the hearts of the young, and from exerting any visible influence upon their

lives and conduct? Shall they believe and blindly obey the absurd and revolting requirements of their fabulous shasters, and shall we practically reject and disobey the injuctions of Divine Truth? Shall they implicitly follow the false and feeble glimmerings of a taper; and shall we close our eyes upon the noon tide blaze of the sun of righteousness? If so, they will assuredly rise up in the judgment against us and condemn us; but let not this reproach rest upon us.

It is upon this foundation that we should endeavor to erect the superstructure of a solid and useful education, and these are the leading principles which we should instil into the minds of the youthful of our country. The comparative utility of the different branches of knowledge usually taught in schools, is a subject involving some inherent difficulties, but which often presents itself in the way of a teacher, encumbered with additional embarrassments, arising from the various and discordant views of his employers. It not unfrequently happens that what is strongly objected to by one, as useless, insignificant or impracticable, is warmly urged and insisted upon by another, as an indispensable and most valuable part of an education. Scarcely a subject stands upon the catalogue of school exercises, that has not thus found its advocates and its opposers; even common arithmetic, geography, history, and the principles of our native tongue, have not escaped the random shots of this literary warfare. Another difficulty in the way of an instructer is, that an almost rabid hankering after what is merely and exclusively practical in education extensively prevails in our community; so that every moment of time which is not employed in teaching pupils something which they will actually be called upon personally to perform in after life, is hastily regarded by some as mispent and lost—as if their future lives were destined to be all action and no reflexion. Were it possible to foresee precisely the future situation, circumstances and pursuits of an individual, his preparatory education might be so regulated and conducted as to correspond to those circumstances and pursuits, in such a manner that he might be enabled to enter upon them with advantages that would lead to a greater degree of success and excellence in them than might otherwise be attained.

Yet upon a careful consideration of the subject, it appears to us extremely questionable whether such a course, with all its supposed advantages, would not suit a state of society in which trades and occupations are hereditary, or like the Hindoo castes, fixed by the condition in which the individual happens to be born, better than it would our free and unfettered institutions, where not only species of employment, but every grade of civil office, rank and dignity, are open to every individual, however obscure his birth or humble his origin. In addition to the natural incapacity of man to pry into futurity, and ascertain the lot and destiny of a human being, with such a degree of exactness as to form the basis of a satisfactory calculation respecting him, there is, in our favored country, the further uncertainty arising from the unlimited field of operation opened to all by those principles of liberty and equality that form the groundwork of our political compact. We cannot predict what the future situation of an individual in life will be, nor which of the numerous departments of learning will be most useful to him. There is, therefore, among us, a manifest necessity for a broader and deeper foundation, a more enlarged and extended plan of early education than can be required under absolute and despotic governments. Wherever the great body of the people are sunk into a confirmed and hopeless state of servitude; where a knowledge of their natural and inherent right could only serve to aggravate their sufferings, and render the yoke of bondage still more galling and intolerable, there, if any where, "ignorance is bliss"; but every native American inhabits the air of freedom from the moment of his birth; his first breath is drawn in the atmosphere of liberty, and he possesses an indisputable claim to an education that will fit him to assume the rank and discharge the duties of an active and intelligent citizen of a free republic. This is his birthright, and no parent can wilfully deprive his offspring of this invaluable inheritance without, robbing him of his dearest political privilege, and forfeiting his own allegiance to the government under which he lives. From this view of the subject it follows, as a necessary consequence, that the course of education suited to the meridian of our country, and to the circumstances and prospects of an American youth, takes a wide

and comprehensive range. It embraces whatever has a tendency to elevate and enlarge his general views of things; whatever will enable him to judge correctly of public men and public measures; whatever will enable him to understand the reciprocal rights and duties of those who rule and those who are ruled; whatever will render him a more active, intelligent and useful citizen, a more judicious counsellor, an abler statesman, a brighter example to others in all that is virtuous and praiseworthy, a more instructive companion, more prompt and capable in business; in a word, whatever will qualify him to sustain all the relations of public, social, and domestic life, in a more complete and efficient manner than he could otherwise do, is clearly within its sphere. This being the case—and of the correctness of these views we entertain no doubt—then it is a mistaken policy to restrict an education to the limits of any one particular profession or calling. It ought not to be circumscribed within so narrow a compass, for its demands, when properly understood, are co-extensive with the whole circle of the arts and sciences, were they attainable. Scarcely a single department of learning can be named that would not contribute towards the attainment of one or more of the objects we have enumerated. There must, however, from the shortness of human life, and the multiplicity and variety of claims of a different kind upon our attention, be a great disparity between what is desirable, in this respect, and what is actually attainable. No man has ever yet been able to boast that he had completed the rounds of knowledge; that he had compassed the great circle of learning. Those who have made the greatest advances, and taken the widest survey of the fields of science, have universally placed the most modest estimate upon their acquisitions, because, from their more extended views and greater light, they have perceived more clearly than others how small a proportion of what they had already acquired bore to what still remained to be acquired. We must bear in mind also, that the youthful intellect is not sufficiently expanded to receive this mighty mass at once: that though capable of enlargement to an unlimited extent, it ought never to be strained with an intensity disproportioned to its actual powers. In order to be safe and salutary, its increase must

be gradual. It must be made to grow, like the body, by receiving its proper aliment in just proportions, and with a due regard to its digestive powers. Unreasonable and unnatural expectations are often indulged with regard to the growth of the understanding while under a course of instruction; as if it must necessarily be rapid; as if the only requisite for making a learned man, or learned boy, were to cause him to read books as fast as possible. This would be just as good philosophy, and no better, than to place before a child a table piled with nutricious food, and expect him to swell up into the perfect stature of a man, in the space of a few moments, merely by devouring it. Knowledge is doubtless the proper food of the mind, and the mind may be made to grow by the reception of it, as the body does by partaking of natural food: but, like the body, it must digest what it receives, in order to be benefitted by it. The secretive powers of the understanding must act upon it, before it can become assimilated to the substance of the intellect, and prepared to give out its nutricious qualities and contribute to the general growth and increase of its dimensions. The parallel will hold still further; for as it is not the greatest quantity and variety of food that causes the speediest and most healthy increase of the body, but the proper operation of the digestive powers upon that food; so it is not the greatest number and variety of subjects communicated to the mind in a given time that secures the greatest and most rapid developement and enlargement of its powers, but the clearness, distinctness and completeness with which it comprehends those subjects. In the process of instruction the mind is never merely passive. Whenever knowledge is usefully acquired, it is always by the action of the understanding upon the subject presented to it. Hence the great secret of teaching is, to secure the co-operation of the pupil with the efforts of the teacher. He should follow the lead of his instructer, whose business it is to explain the subject of every exercise, when necessary, that the pupil shall fully comprehend the principles involved in it, and clearly see the application of those principles in the case before him. It will then be comparatively an easy task to enlarge his views, so as to enable him to apply the same reasoning to other subjects of a kindred nature, and thus to

rise from the comprehension of a particular, individual instance, to a general knowledge of all that belongs to the subject.

It should carefully be kept in view, that the main object and design of early education is to teach the young mind to think: to feel that it possesses powers and faculties that are capable of investigating subjects of a complicated nature, of analysing, discussing, and comprehending them in all their relations and bearings. The moment it ascertains that it can do this, it feels a confidence in itself till then unknown; becomes conscious of its native dignity, and boldly and manfully claims affinity with intellectual being. Nothing inspires the youthful mind with so much courage, nor fills it with such high and exquisite delight, as triumphing over difficulties which at first appeared insurmountable, by dint of persevering and untiring industry; nor can the whole phenomena of animated history present a spectacle more beautiful and interesting than the brightening countenance, the sparkling eye, the glowing cheek, and the quickened breath, that speak the gushing tide of inward joy felt by the youthful champion, as he stands erect, in all the pride of recent victory. Much as it often costs of pains and toil to bring the pupil to this most enviable point—and it is in truth a work of time, and demands a degree of patient, unceasing labor, of almost endless repetitions of "line upon line; line upon line; precept upon precept; precept upon precept; here a little and there a little," of which none but those who know it by experience can form any adequate conception, and to the irksomeness of which the monotonous and wearisome operations of the tread mill bear the only tolerable resemblance in nature, yet it is worth the whole to be enabled at last to arrive at such a crowning consummation. Results thus gratifying and encouraging refresh the spirits of the care-worn teacher, and strengthen his hands. They animate him to renewed and persevering exertion. They are rays of light which shed a cheerful brightness on his path; beams of hope which gladden his fainting soul, and serve to cheer him on his way, as the Oases of the Arabian deserts give new strength and vigor to the exhausted traveller. Success makes men brave, and there never was an instructor or a scholar who did not feel in every fibre of his heart,

the invigorating influences of vanquishing opposing difficulties—of carrying the war into the enemy's country: of attacking one strong hold after another, and taking by storm every post that refuses to surrender at the first summons. Let the young recruit in this holy war against ignorance and error, once feel that he has gained a decided advantage over even one of the obstacles that oppose his progress towards the temple of science—let him once realize that he possesses mental powers sufficient to beat down any one of the obstructions that lie in his way, and ultimate success is certain; a flame is enkindled in his bosom that will not easily be extinguished; an appetite for further acquisitions in knowledge is excited, whose keenness will not soon be appeased; a motive to industry and exertion is thus brought to bear upon his mind with mighty power, and will not fail to form a habit of inestimable value in his future operations: it will almost necessarily lead to a course of mental discipline, that will infallibly call its latent energies into action, and give them new force and elasticity, nor will he be persuaded to relinquish his efforts till he has gained admission into the temple of learning and secured the reward of his victories.

[To be concluded in our next.]

HISTORY.

An account of the most important battles, sieges, &c., recorded in the ancient and modern history of Europe, and in which Europeans were engaged ; chronologically arranged.

[Continued from page 141.]

Battle of the Colne and Theme, A. D. 51, between the Romans under Ostorius, and the Britons and Silures under their king, Carractacus.

The Romans had already reduced nearly the whole island of Britain to subjugation, though they had not succeeded in conquering the Carractacus, who, retiring into the fastnesses of Wales, defended himself with great bravery and resolution. At length, finding a decisive engagement unavoidable, he addressed his countrymen, telling them that this battle would establish their liberty, or confirm their servitude, &c. The Britons fought obstinately, but their ardor availed nothing against the discipline and heavy armour of the Roman legions ; they were routed with great slaughter, and the family of Carractacus were taken prisoners, and he himself was, shortly afterwards, treacherously delivered up to his enemies by his step mother, with whom he had taken refuge. When led through the streets of Rome, and seeing the splendor of the buildings, he only exclaimed, "Alas ! how is it possible that people possessed of such magnificence at home, could think of envying Carractacus a cottage in Britain."

Battle near London, A. D. 61, between the Romans under Suetonius Paulinus, and the Britons under their queen, Boadicea.

The cruelty and tyranny exercised by the Romans upon the Britons, again roused them to action :—led by their heroine, whose daughters had been violated in her presence, they attacked the Romans, slew about 70,000, and set fire to London, which was

reduced to ashes. A decisive battle took place soon afterwards, in which 80,000 Britons fell in the field. After this defeat of her army, the British queen put an end to her miseries by poison.

Siege and reduction of Jerusalem, and destruction of the Temple, A. D. 70.

The Jews having revolted from the Romans, Titus was sent against them by his father, the Emperor Vespasian. Titus sat down with his army before the city, which, after an obstinate defence, was taken by storm : he was anxious to save the Temple, but a soldier having thrown a brand of fire into some adjacent buildings, the fire communicated to the Temple, and in spite of the exertions that were made to save it, that magnificent edifice was soon reduced to a heap of ruins. The greatest part of the citizens were put to the sword, and the city was entirely razed by the plough, so that not one stone was left upon an other.

Battle of the Grampian Hills, A. D. 79, between the Romans under Agricola, and the Caledonians under their leader Galcacus.

In this battle the Caledonians, to the number of 30,000, were defeated, with the loss of 10,000 killed. This victory completing the reduction of the British island under the Romans, no further resistance was made to their dominion in the southern provinces of Britain.

Siege and Capture of Philipopolis, A. D. 250. The Goths, who now begun to encroach upon the distant provinces of the Roman empire, had crossed the Danube, and laid siege to Philippopolis, a city of Thrace, which was, after a long resistance, taken. A hundred persons are reported to have been massacred in the sack of the city. In attempting to relieve the city, the Roman army under the emperor Decius was attacked by the Goths under their king Criva, and completely routed.

Battle of Teroberonii, A. D. 250, between the Romans under the emperor Darius, and the Goths under their king Criva.

Anxious to prevent the advance, and to cut off the retreat of the invading Goths, Darius repaired and strengthened the fortifications

on the Danube, attacked and cut off such parties of soldiers as were hastening to share in the victories of their countrymen, and anxiously sought an opportunity of retrieving his own glory and that of the Roman arms. The two armies, under their respective sovereigns soon met, and a terrible conflict ensued, which resulted finally in the death of Decius and the defeat of the Roman army.

Battle of Naissus, A. D. 269, between the Romans and the Goths.

The Goths, who had for many years harrassed the frontier provinces of the Roman empire, were now attacked by Claudius, near the city of Dardania, and after a long and obstinate engagement, routed with the loss of 50,000 men killed, and nearly the whole of the remainder of their army, which is reported to have amounted to 300,000 men, taken prisoners.

Battle near Emesa, A. D. 272, between the Romans, under the Emperor Aurelian, and the Asiatics under Zenobia, the Queen of the East.

Zenobia, a most heroic and extraordinary woman, having disclaimed the authority of Rome and refused to submit to her dominion, Aurelian marched his forces against her and encountered her army near the city of Emesa. The Queen of Palmyra behaved with great coolness, animated her army by her exhortations and encouraged them by the confidence and self-possession which she evinced. But notwithstanding her judicious arrangements, and the discipline and faithful attachment of her troops, victory declared against her. Palmyra was now her last and only hope. She retired to that famous city, shut herself up within its walls, and defended it for a long time with obstinate firmness; finding, however, the city unable to hold out, the queen attempted to escape into Persia, but was overtaken and brought a captive to the emperor. Her city with all its immense wealth soon fell into the hands of the conqueror. Zenobia was reserved to grace the triumph of Aurelian, but her secretary, Longinus, the celebrated critic, was put to death, and met his fate with dignity and submission.

Battle near Rome, A. D. 312, between Constantine, afterwards sirnamed the Great, and Maxentius, his rival for the empire.

The army of Constantine consisted of 90,000 foot, and 8,000 horse, while that of his adversary amounted to 120,000 foot, and 18,000 horse. The engagement was for some time fierce, bloody and doubtful; but victory at length declared in favor of Constantine. Maxentius was drowned in his flight.

Battle near Adrianople, A. D. 378, between the Romans and the Goths.

In this battle the Goths, who had been permitted to enter and settle in the empire, were victorious. The emperor, Valens, was killed, and two-thirds of his army destroyed.

The invasion of the Roman dominions, by the Goths, under Alaric, A. D. 397.

The celebrated and renowned Alaric having entered the Roman territories, deluged the country with his myriads of barbarians, and carried his devastations to the very gates of Constantinople.

Battle of Pollentia, A. D. 403, between the Romans, under Stillicho, and the Goths, under Alaric.

Stillicho having at length succeeded in forcing Alaric into a general engagement, defeated him with great slaughter. Alaric, in this and a subsequent battle, lost nearly the whole of his army, and owed his own life to the fleetness of his horse. For this signal service, Stillicho was soon after ordered by the ungrateful emperor, Honorious, to be executed; he submitted to his fate with manly resignation.

The Siege, Capture and Plunder of Rome, A. D. 410, by the Goths under Alaric.

After the death of Stillicho, Alaric again made an irruption into Italy, advanced immediately to Rome, which was besieged and finally taken, pillaged, and burnt by the barbarians. Rome, the proud mistress of the world, and the depository of its wealth, which had for eleven hundred and sixty-three years been fattening upon the spoils of other nations, was now humbled in the dust, and compelled, in turn, to suffer those calamities which she had so often inflicted upon other cities and nations.

[To be continued.]

CHRONOLOGY OF IMPORTANT INVENTIONS, Discoveries, and other interesting events relating to the improvement of society.

[Continued from page 143.]

1457 Glass first manufactured in England.
1460 Engraving on wood invented.
" Engraving on copper invented at Florence.
1462 Post Offices established in France.
" The first book printed, viz: the vulgate Bible.
1466 The second book printed, viz: the Cicero de Officiis.
1467 Electricity discovered.
1468 First book printed in England.
1470 The art of taking busts, in plaister, invented by Verochio.
1473 The study of the Greek language first introduced into France.
1477 Watches invented at Nuremburg. The Emperor, Charles V., was the first person who carried one in his pocket.
1479 University of Upsal founded.
1482 The Portuguese discover the coast of Guinea.
1483 Post horses and stages established in England.
1487 The Star Chamber Court established.
" The Cape of Good Hope discovered.
1489 Maps and sea charts introduced into England.
1491 The study of the Greek language introduced into England by Wm. Grocyn.
1492 Variation of the compass discovered by Columbus.
" America discovered by Columbus.
1494 The University of Aberdeen founded.
1496 Tobacco first discovered in the island of St. Domingo.
1497 Vasques de Gama doubles the Cape of Good Hope, and proceeds to India. This was the first voyage ever made from Europe to India.
1500 Painting in Chiaro Obscuro discovered.
1504 Hats made at Paris.
1510 " first made in England.
1512 Etching on copper invented.

1512 Republic of Genoa founded.
1515 Camera Obscura invented.
1520 First Map of England made.
" Stops in Literature first used.
" Chocolate first introduced into Europe from Mexico.
1522 First voyage round the world.
1525 Hops first used in malt liquors.
1530 Spining wheels invented at Brunswick, by Jurgen.
1531 Post Offices first established in England.
1533 Flax and Hemp first cultivated in England.
1539 The Bible first printed in English.
1543 Pins first introduced into England from France.
1544 Iron first cast in England.
1545 Needles first made in England by foreigners.
" Knitting invented in Spain.
1547 Silk stockings first worn by Henry II., of France.
1548 Orange trees first brought from China to Europe by the Portuguese.
1549 Platinum discovered.
1550 The Sextant invented by Tycho Brahe.
1552 Books of Astronomy and Geography destroyed in England as magical.
1557 Glass bottles and vessels first made in England.
1561 The first Observatory built at Cassel.
1563 Knives first made in England.
1564 The beginning of the year fixed on the first day of January.
1568 The first clock makers in England—they came from Delft.
1569 Policies of Insurance, in writing, first used in Florence.
1575 University of Leyden founded.
1576 The dip of the compass first discovered.
1577 Sir Francis Drake sails on his voyage of circumnavigation round the globe, and returned three years after.
1579 The Republic of Holland commenced.
1580 The University of Edinburgh founded.
" Carriages first used in London.
1582 Pope Gregory reforms the Julian Calendar, and introduces the new style into the Catholic countries.

1588 The first newspaper published in England, dated July 28.
" Bomb shells invented by Venloo.
" Paper first made in England.
1590 Telescopes invented by Jansen.
1591 The University of Dublin founded.
" Tea first brought into Europe.
594 Logarithms invented by Baron Napier, of Scotland.
" The Bank of England incorporated.
1601 An act passed in England to prevent men from riding in coaches as effeminate.
1602 Decimal Arithmetic invented at Bruges.
1608 Baize first made in England.
1610 Jupiter's Sattellites first discovered by Gallileo.
" The Thermometer invented by Drebbel.
1618 The Steam Engine invented by Savary ; tried, however, by Blasco, in the reign of the Emperor Charles V.
1619 The circulation of the blood discovered by Harvey.
1621 Microscopes first used.
1631 Calicos first imported into England.
1641 Coffee first used in England.
1643 Barometers invented by Torricelli.
1650 Mezzotinto engraving invented by Prince Rupert.
1654 The air pump invented by Otto Van Guericke.
1657 Reflecting Telescopes invented.
1660 Royal Society founded.
1665 The compound nature of light discovered by Sir I. Newton.
1666 Chain Shot first invented by Admiral De Witt.
1669 Fluxions invented by Newton.
1676 Greenwich Observatory built.
1681 The penny-post first established in London.
1694 Hackney Coaches established in London.
1699 Phosphorus discovered.

[To be continued.]

CHRONOLOGY OF THE PRINCIPAL events in the discovery and early settlement of America, and the history of the United States.

1492 October 12, America discovered by Columbus.
" " 27, Cuba discovered.
" Dec. 24, Hayti discovered.
1493 May 5, Columbus discovered Jamaica.
1497 June 24, Newfoundland discovered by John Cabot.
1498 July 31, Trinidad discovered by Columbus.
" August 1, Columbus discovered the Continent of America, or, as it ought to have been called, COLUMBIA.
1500 April 23, Cabral discovers Brazil, and
" May 1, Takes possession of it for the crown of Portugal.
" August 28, Bobadilla arrives at Hispaniola and sends Columbus home in chains.
1504 The Newfoundland fishing commenced by some French vessels.
1506 May 20, Columbus died at Valadolid, aged fifty-nine years.
1508 Thomas Aubert, master of the ship Pensic, first sails up the river St. Lawrence.
" Negro Slavery introduced into the West India islands.
1512 April 2, Florida discovered by Juan Ponce de Leon, though it was probably seen by Cabot, in 1497.
1513 Sept. 25, The Pacific Ocean discovered by Vasco Nuner, from the top of a high mountain, on the western side of the Isthmus of Darien.
1517 Charles V. grants to a Flemish favorite the exclusive right of importing 4000 negroes annually to the West India Islands; and from this time commenced a regular commerce in slaves between Africa and America.
1518 The southern coast of the bay of Mexico discovered by Grijalva, who called the country New Spain.
1519 March 13, Cortez lands at Tabasco, on his first expedition against Mexico.
" Nov. 8, Cortez enters the city of Mexico, and is received by Montezuma with great hospitality; but soon afterwards treacherously seizes this monarch, and makes him a prisoner.

1519 " 7, Magellan discovers the straits that bear his name, and on the 28th of the same month entered the great southern ocean, which he called the Pacific. After entering the Pacific Ocean, Magellan sailed northwesterly 3000 leagues, and on the

1521 13th March, discovered the Philippine Islands, at one of which he was killed. The ship Victory continued her voyage under command of John Sebastian, and returned to Spain,

1522 7th September, by the way of the East Indies and the Cape of Good Hope, having performed the first circumnavigation of the earth.

1531 Pizarro conquers Peru, exacts a ransom from the Inca of more than six and a half millions of dollars, and then basely and inhumanly puts him to death.

1535 Montreal discovered and visited by Cartier, a Frenchman, who gave the name of the country around the name of New France.

1539 Ferdinand de Soto, Marquis of Florida, undertakes the conquest of that country, but after landing at the bay of Espirtu Santo, was obliged to retire.

1542 Soto, in his expedition, passed through the Indian towns of Alabama, Tuscaloosa, and Mavila, near the mouth of the Mobile river. (Probably the same which is now Mobile.)

1548 The first act of Parliament passed relating to the Newfoundland Fishery.

1562 John Ribault sails from France with two ships and a number of French protestants, who made a temporary settlement in Florida, but were finally obliged to abandon the country.

1564 June 26, Laudonniere arrives at Florida, with provisions,&c. for his countrymen, who he found had left.

1565 Aug. 28, Ribault returns to Florida.

" Sept. 12, The French, under Ribault and Laudonniere, attacked by some Spaniards who arrived, and nearly all of them massacred.

1568 In retaliation for this massacre of his countrymen, the Chevalier Gourges sailed from France, arrived at Florida, attacked the Spaniards, captured them, and hung all who had escaped death in defending themselves.

" May 3, Having razed the forts that had been built, the French bade a final adieu to Florida.

1581 French trade to Canada removed, after an interruption of near fifty years.

1583 Aug. 6, Sir Humphrey Gilbert takes possession of Newfoundland in the name, and by the authority of, the queen of England.

1584 Virginia discovered and taken possession of by Amadas and Barlow, who were sent out by Sir Walter Raleigh.

1585 June 26, The first settlement of Virginia commenced by a colony sent out by Sir. W. Raleigh, under the command of Sir Richard Grenville and W. Ralph Lane. This was the first English colony ever planted in America.

1586 July 28, The colony of Virginia having suffered great distress for want of provisions, embrace an opportunity offered them by Sir Francis Drake, and all return to England. Gov. Lane having carried a quantity of tobacco with him to England, the smoking of it now became fashionable.

1587 April 26, Sir W. Raleigh sends a second colony to settle Virginia, under Gov. White.

" Aug. 18, The first English child born in America.

" " 27, Gov. White returns to England to procure supplies, but of the persons left behind, being 117, nothing was ever afterward known.

1589 March 7, Sir W. Raleigh having expended 40,000*l.* in fruitless attempts to colonize Virginia, now assigned his patent to Thomas Smith and other merchant avdenturers.

[To be continued.]

FINE ARTS.

LECTURES

DELIVERED TO THE STUDENTS OF THE NATIONAL ACADEMY OF DESIGN,

ON HISTORICAL PAINTING.

By William Dunlap.

LECTURE II.

Gentlemen Students,—I will seize this opportunity to congratulate you on the flourishing state of the school, and on its excellent accomodations in this noble building—a building which does honour to the liberal spirit of the mercantile interest of the city.* I cannot, and I hope you cannot, enter this school without remembering with gratitude the accomplished and amiable founder.† To our president, now in Rome, we owe the establishment of an institution which cannot be shaken, as it is dependant for its success on the merits of our artists, and its acknowledged utility.

In my first discourse I have spoken of *contour* or outline, as the commencement of the representation of any object on a flat surface. I have said that a round object or globe, seen through a transparent plane, would give as its outline a circle. This circle might be traced on the transparent, perpendicular plane, for example on a thin gauze stretched over a frame, and would be the exact contour of the globe, representing not only its shape but its size as it appears, larger or smaller according to its distance from the frame with its gauze. It will be the true and exact outline of the object, but will not represent it—it will not look like a globe. As it will be only a circle, it may pass as well for the picture of a ring, or a dollar, as for a billiard-ball, or the earth we inhabit, or any other planet. It is as flat as the surface on which it is delineated. But by another part of the art of drawing or painting, it can be made in appearance to swell, to

* Clinton Hall. | † S. F. B. Morse, Esq.

become round, to be a globe; and, as far as the eye of the spectator is concerned, to be detached from the surface on which it is delineated, and stand surrounded by air as if inviting the hand to seize and bear it away. This is done by the distribution of light and shade, and those reflected lights which with half tints form the principal portion of the *chiaro scuro*, of the Italians—*a clearness, or even brightness, in shadow or obscurity.*

To exemplify this very important branch of the art of painting, teachers have made use of the billiard ball. Place it before you on a table so that *one* light from a lamp or window shall fall on it, and it will develope the whole mystery of light and shade as made subservient to the representation of round or prominent objects on a flat surface by one or more colours. The part of the ball nearest the light, which ought, as in nature, to come from above, will be illuminated brightly in one place, more or less distant from the outline, as the light is more less in front of the ball. From the strongest light it gradually diminishes, first into *half tint*, and then by degrees becomes lost in shadow as the surface of the globe turns from the lamp or window; but as you approach the outline opposite to the light, you see that the shadow diminishes and gives place to a lighter colour, more or less brilliant according to the tint of the table on which the ball stands, or the degree of light or brightness of the colour of any neighboring substance. This is a reflected light or colour. After these lights, shades, and reflected lights are imitated, the circle will assume the form of a globe. Look then upon the table and you will see a shadow produced by the ball; *this* imitated, the picture of the ball will be perfect; and appear perfectly detached from the flat surface on which the circle was drawn. This simple theory of light and shade is applicable to objects of every shape. If the contour of any object delineated is not truly drawn, or if the light, shadow, or reflected light are any one of them misplaced, that object is not truly represented; it is *out of drawing*. The human head, a tree, a rock, a cloud, each has its principal light, its subordinate light, its half tint, its shadow, and its reflected light.

When a number of objects are combined, some behind others, either near to, or touching each other, they form a group; and as

in the individual object, so in the group, there must be but one principal light, however many may be the inferior, or the reflected lights.

To elucidate the light shadow and *chiaro scuro* of the group, teachers have employed the bunch of grapes; each grape having in itself the whole theory of the billiard ball, and the whole combined exhibiting the same principle and forming one mass, which, when seen dimly, would appear as one object.

A group of figures in a painting gives more satisfaction to the spectator than many seperate or disjoined figures. The eye is said, and truly, to repose on a well constructed group. In a great composition many groups are combined by the unity of design; and by such combination the art of historical composition reaches its highest degree of perfection.

The distribution of the lights and shades and reflected lights of a group, or combination of groups, is called, after the Italians, *chiara scuro*. By this term we understand such a distribution of lights and shadows, half tints and reflections, as best satisfies the eye, gives repose, keeps each object in its proper place, and unites the whole in one harmonious mass, evidently producing the effect intended by the author.

As in the representation of each object, when painted, there must be but one governing or principal light; and as the same law is applicable to each group; so, the whole composition, to preserve harmony and unity of design, must have one light, which if not the brightest, must be the broadest and most obvious in the picture. When seen by a dim light or with the eyes partly closed, the greater lights of a picture become more apparent, the forms melt into masses, the eye traces the connexion of one light with another, and the spectator is pleased to observe that, although distinctness is lost, harmony is preserved, and even increased.

In speaking of colours and colouring I shall have occasion to mention *chiaro scuro* again, and to point out the meaning of the words as applied to that branch of the art of painting.

Before I touch on the subject of colouring let me give you a word of advice on the more important subject of drawing, in addition to what I have said. As students I conjure you to consider the fa-

cility of drawing *truly* from the human figure, as the foundation of all excellence in every branch of the art of painting. Study and draw from the beautiful forms left us by the sculptors of Greece at every moment of leisure during life. Compare the statues, and the drawings you shall make from them, with nature. We hope that another year will not pass without establishing a school for drawing from the life and giving you in this Academy every opportunity which the institutions of a similar nature in Europe give, for perfecting yourselves in this most important part of the art of painting. In the mean time draw from the living figure assiduously at every opportunity, and truly copy even the defects of your models. Consider truth as the foundation of excellence; never forget that your taste must be formed by a study of the Antique, and that to acquire a refined taste, you must cultivate every art, every science, and every feeling belonging to the character of a gentleman. But however great your knowledge or refined your taste, your power in composition will depend upon your diligent observation of nature, and the habit you will by labor acquire, of representing her with fidelity. Do not suffer yourselves to be misled by a false notion of the value of ideal beauty. Seek in nature for models of beauty, copy them faithfully and correct that which you find deficient or redundant by the standard of taste you shall have acquired. From these general observations I will now return to the particular modes of practise in historical painting.

The historical painter having decided on his subject and made himself master of every thing that the historian or the poet or the antiquarian can furnish him with, (if the subject belongs to ancient history or mythology) he then combines the personages by an effort of imagination into such groups, with such actions, as the subject suggests. These are however still phantoms—"airy nothings." He next draws on paper or canvass, generally of a miniature size, the figures and groups he has imagined. They now become somewhat more real. He will then combine his lights and shadows for the general effect of his picture, drawing his figures more correctly. But before they are deserving of the "local habitation and the name" he aspires to give them, he must seek for models as nearly conformable as possible to his intended historical person-

ages, and by indefatigable labor and study give from nature, modified and corrected to suit his historical or poetical heroes, the true representation of each character as far as taste, genius, and knowledge can represent those who only live in the records of times long past, or in the lays of the bards who have given them immortality.

I will now touch on a secondary and very fascinating branch of the art; and in these brief discourses I can but touch on any one of the many branches of knowledge necessary to the historical painter. We will now consider colour, colours, or colouring. Again let us recur to the upright transparent plane with the circle delineated upon it. We have seen that by light and shadow the circle becomes a globe or ball. This ball is still colourless. By the aid of colour we can make it a ball of iron or of lead, of silver or of gold. Or we can represent our planet, the earth, or one of its fruits; an orange, an apple, a cherry, or any thing else that is globular. Such is the magic of colouring.

There are but three colours, yellow, red, and blue. Every other tint is but a compound of these, or of two of them, either by mingling the opaque material or by showing one through the other in a transparent state. There is no object, whatever its local or apparent colour may be, that does not require all these three colours to represent the one local colour. The local colour of the cherry is red; but in its half tint and shadow it is darkened by blue, and its reflected light is brightened again by yellow. The reflected light of a blue object is made green by yellow, and its shadow is formed by red. And a yellow ball will be rounded in its shadow by blue, and its reflected light will be warmed by a mixture, or tint, of a reddish hue. Thus every object has its *local colour*, its *shadow colour*, and its *colour by reflexion;* which last depends more or less upon the colour of the object, or objects, adjacent to it. Thus an object of a cold colour placed in the neighbourhood of warm colours, red or yellow, is warmed by reflexion from its neighbours.

The local colour of any object is seen but in a small portion of that object, and consequently the painter must show but little pure colour in his work. The greater portion retires into half tint or

shadow; and the artist must break or mix his colours or he will not represent nature. Or he must pass one colour over the other, as in nature the bluish tint of the atmosphere transparently envelopes every object, and shadows veil it, in part, from the eye of the observer; but through the shadow, the figure must be seen and the local colour indicated. The forms must be preserved in their purity of drawing. In this, as in all things, we must not lose the substance, while pursuing the shadow.

There is an artist of the present day, of great merit, "of imagination all compact," who errs in this respect eminently. He produces vast effect in his pictures, but his individual forms, particularly the figures of human beings, are exaggerated, incorrect and distorted. Compare such pictures with those of Raphael, and other Italian masters; with Poussin, Le Seur, and David, of the French school, or with West; and it will not require the gift of prophecy to foretell that their day must soon pass by, except as they are admired for effect.

The colouring of a great picture should be conformable to the subject. By colouring I now mean the distribution of colours over the whole. I have spoken of harmony and unity of design in the composition of a historical picture, and in the management or distribution of its lights and shadows; harmony is no less requisite in the colouring. As said of the lights and shades, so it may be said of the colours, the whole mass seen indistinctly must give pleasure, and that pleasure should increase as the figures become defined. The various tints and local colours should be so connected by skilful distribution as to assist each other and increase the general effect. No one colour should preponderate. This is the *chiaro scuro* of colouring, and it may be best explained by dividing the compound term. *Chiaro* not only signifies those bright and perfect or pure colours which receive the full lights, but all the luminous tints and reflected lights; and *scuro* may be understood to signify not only the positive shadows thrown on coloured objects, but such tints as when exposed to light still maintain a degree of obscurity. In the management of the *chiaro scuro* of a picture, nature and nature alone can be the painter's guide, as in every other part of his difficult and delightful art; still he will re-

ceive very important aid from studying the works of those masters who have left immortal monuments of their genius and industry.

The painter must imitate nature by imitating the local colour of the objects he represents; but he still imitates nature when he makes that colour more or less pure or bright, mixed or obscure, according to the place, the time, and other circumstances connected with his subject. The colours of objects become broken and mingled, or faint and vanishing, from the various circumstances of light, shadow, approximation to other colours, and *distance from the spectator*. Colour becomes faint and fainter, as the object recedes from the eye and becomes apparently smaller.

With a few observations on the multifarious qualifications and acquirements necessary to the historical painter. I shall conclude this lecture.

I have already spoken of some of the qualifications and branches of knowledge necessary to the painter of history; but more, much more, is requisite to his perfection and success. Writers on the histrionic art have justly considered the union of natural and artificial powers which go to the formation of a perfect actor as so great, that their display in one man stamps him as a kind of miracle. But the combination of qualities and science, of natural gifts with acquired knowledge, powers and facilities, the product of study and labor, necessary to the formation of a successful historical painter, are greater beyond all comparison; and yet, as miracles have ceased, we may look for such an artist without disturbing the order of nature, though not without the blessing of nature's beneficent Author. Raphael stands conspicuous among painters; but he was not a miracle. We know that he had great natural gifts and the fostering encouragement of the powerful; but we know that his love of his art caused him to seek for knowledge with indefatigable enthusiasm. He copied the beauties of the ancient sculptors, and sought in the works of all the artists who had preceded him for models by which to improve himself; yet never ceasing from the study of nature. And we know that he progressed, like other men, from ignorance and imperfection, to that knowledge and perfection which has made him the admiration of succeeding ages.

The historical painter must have the imagination of a poet and the research of a lexicographer. He must master, at least so far as to read them, as many languages as the short time he has allotted to him well permit. The ancient tongues he must study for knowledge of the fountains from which the moderns have drawn their treasures; and the modern languages for daily improvement in his art. French is becoming more and more necessary from the intimate connexions we have with that great country, where liberty and the arts will henceforward go hand in hand. Italian has long been the language of the fine arts, and will be found, after those mentioned, of easy acquisition. Spanish follows of course; and German is the organ of philosophy, poetry, romance, and all that adorns mankind. All these I would wish for the historical painter, not to write or to speak, but to read. He must gain ideas from every source; he must communicate them with his pencil rather than by any other mode of expression. He must be a mathematician to master perspective. He must be a historian and an antiquarian. He must be acquainted with all the poets, and a master of mythology. He must be an architect and acquainted with the architecture of all nations. He must have a knowledge of chymistry and mineralogy, to understand the nature of the pigments he uses. He must be intimately acquainted with the costumes of all countries, and of the various ranks of their inhabitants. He must be a good anatomist. He must, above all, have the taste and feelings of a polished gentleman, the love of truth and the patience of a philosopher, and the kindly disposition, which will fill him with gratitude to his Creator, and charity aud love to his fellow men. The qualifications I have desired for the historical painter are desirable for the artist of every denomination.

In my next I shall speak of aerial perspective, costume, and that very valuable property in an artist which leads to a proper *choice of subject.*

[The third leture will appear in our next.]

ARCHITECTURE.

Architecture has been justly included among the fine arts. It requires vast powers of conception to originate, exquisite skill to execute, and no inconsiderable degree of taste or sensibility fully to relish the beauties, or feel the sublimity of a first rate specimen of architecture. There is, perhaps, a feeling implanted within us, by Divinity itself, which, though it may never have been disclosed to the obtuse observation of its possessor, may be excited to life by proper means, ready to respond on all occasions to these exterior calls upon our sensibilities. The pleasure to be derived from this source, therefore, renders it an object of importance to be well acquainted with the several species of architecture, the principles of their structure, and the grand characterestics by which the different orders are distinguished.

The Egyptians, the Persians, the Chinese, the Greeks, and the nations of the dark ages, have each of them had a system of public building peculiar to themselves. Of all these the Greek is the most celebrated, particularly in this country, and the most deserving of our consideration. It consisted of five orders; the Doric, the Ionic, the Corinthian, originals; the Composite, as its name denotes, composed by a union of the second and third orders; and the Tuscan; a mere modification of the first. This succession indicates their history, and the distinguishing marks of each, *a posteori*, in some degree, point out the progress of ancient civilization and refinement. The Doric is the most simple and unassuming original. Its massy thick-set column and plain Quaker capital plainly enough suggest the first stage of the arts, after mankind had passed from a disconnected pastoral or hunting state of existence into regularly organised communities.

We pass then to the Ionic. Its diminished columns, its voluted capital, its rings of bead work and egg and tongue moulding, denote a further advance from the first outset in regular improvement. Men are always dissatisfied with their present attainment; hence they are always elevating their standard to greater and greater heights, and continually exerting themselves to attain to loftier degrees of excellence. Therefore, last, not least, the Corinthian is dis-

tinguished by its elegant slender column and the highly wrought acanthus leaves of its capital. The celebrated Burke has classically observed that the nobility are the Corinthian pillars of society Community, at last, in the regular course of things arrives at the greatest degree of improvement of which human institutions are susceptible. Learning, refinement, wealth, and priviledged orders, crown the climax. And, if the fine arts keep pace, they will at the same time be brought to the highest state of cultivation. Still it would be natural to seek for some new elegancies to please the fancy, some further gratifications to tickle a palled appetite. Hence a combination of the beauties of the Ionic and Corinthian produces the composite, in the extreme of refinement; or the disappointment of satiety, and a disposition to hasten from one extreme to another induces violent assaults upon the simple unoffending entablature of the Doric, stripping it of its triglyphs and mutules, and thus leaving what may be called the naked, cold, unmoving Tuscan. Such we might suppose to be the probable course of improvement, taking the fine arts as indices of the state of society. Where moral certainty is not attainable, opinion and speculation must supply the deficiency.

In this country we can boast of no architecture of our own, but have copied principally from the Greek and Roman models. We can hardly claim stately and magnificent edifices, whose richness dazzles the eye, whose lofty domes are amid the heavens, and whose commanding collonades fill us with astonishment. And, even if the genius of Ctesiphon and Sctinus be among us, circumstnces may perhaps conspire to prevent its developement. The plainness and simplicity of republicanism may not demand the elegance of the Parthenon, or the sublimity of the Colisæum and Amphitheatre, to consummate our national glory. The ancient Divinities, it was supposed, would not condescend to honor ordinary structures with their presence; nor to hear the prayers of that people who were unwilling to erect them the most magnificent temples. But our God dwelleth not in temples made with hands, neither hath he pleasure in the work of men's hands. He is the great Architect; ever ready to hear us in his own habitation, the great temple of nature.

USEFUL ARTS.

SCENOGRAPHY.

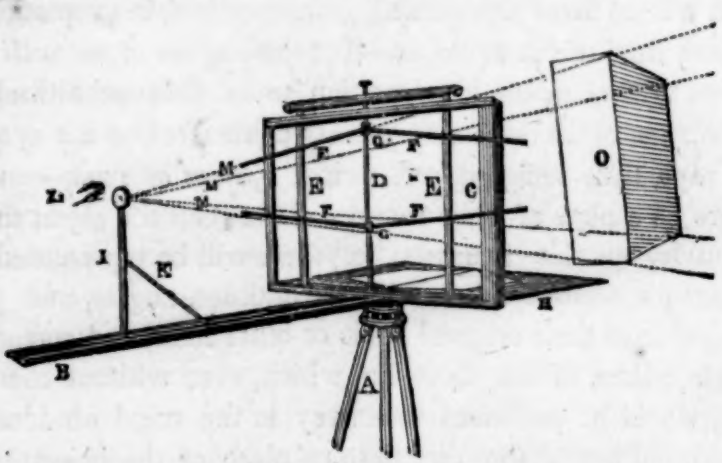
BY J. STICKNEY.

In order to form an idea of the principles of *Linear Perspective*, it is necessary to consider that rays of light, reflected from any *object*, to the eye, forms on the retina *a picture of that object*—that it will be there represented, greater or less, in proportion to its *distance* from the observer, and that the *angles* of its *outline* will be *more or less acute*, in proportion to its distance, altitude, and the direction of its respective *planes* or surfaces, to the eye—that these rays, thus reflected, will form a *system of rays*—and that if there be a plate of glass interposed between the object and the eye, (under suitable circumstances) there will be represented a perfect picture of that object, with its outlines, angles, and planes. Changed from their original cubic or other form, and spread upon a single plane, of one direction, which, even without the aid of colors, would be sufficient to convey to the mind an idea of its original. That if the direction, or place of the object, position of the observer, or plane of the picture, be changed, another configuration of its outline will be formed; and hence, no two positions of one object, can have the same picture, but that similar position only can produce a similar picture. Hence the outline of objects becomes a mathematical figure, capable of demonstration, whose size and form will be in proportion to its distance, altitude, and angle of its planes to the eye of the observer, taken together with the height of the eye, and the distance of the plane of the picture.

In reference to these principles, the following instrument has been constructed; with it the exact perspective, size, form, and proportion of those objects which are bounded by definite planes, can be measured; and it is used, either practically, for that purpose, or to illustrate to the pupil, by a simple and tangible problem, the

optical effects of objects on the eye, definitions in Scenography, and the manner of projecting them, by geometrical principles, upon a plane.

It is believed that a knowledge of Scenography is absolutely necessary to enable a person to draw with any degree of correctness; that this knowledge can be obtained in full by the process used by the inventor, in a few concise and systematic lessons, to the saving of much time and expense, beside the satisfaction of knowing, to a mathematical demonstration, that the figure produced is a correct one, all which are lost to the pupil by pursuing the ordinary method of instruction.



EXPLANATION OF THE CUT.

A is a common tripod.

B, a horizontal bar attached to the upright frame C., by hinges, for the purpose of being made more portable, and containing a slide upon which the sight vane rests.

C is the frame through which the object is seen, and answers to the place of the plane of delineation. Within this frame are situated three vertical bars, one of which is near the centre, and intended to mark the centre of the picture of any object, upon which are affixed two sets of horizontal rulers, which move up and down the bar; this bar may be moved to the right and left, as occasion may require, and is made perpendicular by the graduation scale on the frame, and screwed fast by a nut on the top, and is marked at D.

E, E, two sliding vertical rulers, intended to cut the perpendicular sides of vertical planes.

F, F, F, F, four rulers connected in pairs by nuts at G, G, on pieces of brass, which slide on the steel rod D.

H is the drawing board, which is raised into the frame C, when the object is to be delineated on it; I is the standard and sight vane; supported by the brace K; L is the place of the eye.

M, M, &c., are supposed rays of light passing through the plane of delineation, from the object O.

In making use of this instrument for obtaining the perspective of objects, place the sight vane at such distance from the frame, or plane of delineation, as will give the most agreeable size to the picture; then having chose the nearest or most conspicuous part of the landscape or object, bring the centre or vertical bar, to cut that part (directly between the eye and it) moving the lower rulers to cut the base, which will give its perspective distance in the landscape; and bringing the upper ones to its apparent altitude, will give its perspective height; then bringing the horizontal rulers to bear upon the vanishing lines, that is, the sills and cornishes, (if it be a house) will show their apparent vanishing; also bringing the vertical sliding or parallel rulers, to cut the sides of the planes, will give their apparent width. After all the rulers (or as many as is convenient) are brought to bear upon the outlines of the original object, which they respectively represent, raise up the drawing board against the frame or plane of delineation, and mark the line on it by the rulers; it is then let down, and the rulers brought to bear on other objects or parts of the same, and so on continually until the landscape is finished.

OF THE MANUFACTURE OF STEEL.

Steel is nothing more than iron combined with a portion of carbon. The process of converting iron into steel is ordinarily by what is termed *cementation:* the bars of iron, which are to be thus converted into steel, are placed in a bed of charcoal dust, or pounded charcoal, and then covered with clay to exclude the air;

the whole mass is then kept at a red heat for eight or ten days. In order to ascertain the progress of cementation, the operator occasionally withdraws a bar, called the *test* bar, from this mass, by means of an aperture in the side. When this process is completed, the fire is extinguished, and the whole left to cool.

"The iron thus prepared," says Dr. Bigelow, "is called *blistered steel*, from the blisters which appear on its surface. To render it more perfect, it is subject to the action of the hammer, in nearly the same manner which is practised with forged iron; it is beat very thin, and is thus rendered more firm in its texture, and more convenient in its form. In this state it is called *tilted steel*. When the bars are exposed to heat in a furnace sufficient to soften them, and afterwards doubled, drawn out and welded, the product is called *shear steel*. *Cast steel* is made by fusing bars of common blistered steel with a flux of carbonaceous and nitrous substances in a large crucible, placed in an air furnace. When the fusion is complete, it is cast into small bars or ingots. Cast steel is harder and more elastic, has a clearer texture, and receives a higher polish than common steel. It is also further improved by being subjected to the action of the hammer."

We often hear blacksmiths and cutters speak of *case hardening;* this process consists of partially converting the article into steel. The instrument to be case hardened is usually enclosed in a box with some animal charcoal, old leather, the hoofs of horses, oxen, &c., or some other carbonaceous substance, and is then exposed to heat until its surface is converted into steel.

The following observations on the subject of *tempering* steel, we extract from the Elements of Technology:

"The most remarkable, as well as the most useful, of the properties of steel, is the power which it has of changing permanently its degree of hardness, by undergoing certain changes of temperature. No other metal, says Thenard, is known to possess this property, and iron itself acquires it only when it is combined with a minute portion of carbon. If steel is heated to redness, and suddenly plunged in cold water, it is found to become extremely hard, but at the same time it is too brittle for use. On the other hand, if it be suffered to cool very gradually, it becomes more soft

and ductile, but is deficient in strength. The process of tempering is intended to give to steel instruments a quality intermediate between brittleness and ductility, which shall ensure them the proper degree of strength under the uses to which they are exposed. For this purpose, after the steel has been sufficiently *hardened*, it is partially softened or let down to the proper temper, by heating it again in a less degree, or to a particular temperature, suited to the degree of hardness required; after which it is again plunged in cold water.

"Different methods have been pursued, for determining the temperature proper for giving the requisite temper to different instruments. One method is to observe the shades of color which appear on the surface of the steel, and succeed each other as the temperature increases. Thus at 430 degrees of Fahrenheit, the color is pale, and but slightly inclining to yellow. This is the temperature at which lancets are tempered. At 450 degrees, a pale straw color appears, which is found suitable for the best razors and surgical instruments. At 470 degrees, a full yellow is produced, suitable for penknives, common razors, &c. At 490 degrees, a brown color appears, which is used to temper shears, scissors, garden hoes, and chisels, intended for cutting cold iron. At 510 degrees, the brown becomes dappled with purple spots, which shows the proper heat for tempering axes, common chisels, plane irons, &c. At 530 degrees, a purple color is established, and at this degree the temper is given to table knives and large shears. At 550 degrees, a bright blue appears, used for swords and watch springs. At 560 degrees, the color is a full blue, and is used for fine saws, augers, &c. At 600 degrees, a dark blue, approaching to black, has become settled, and is attended with the softest of all the grades of temper, used only for the larger kind of saws.

"Another method of giving the requisite temper has been practised upon various articles. The pieces of steel are covered with oil or tallow, or put into a vessel containing either of these ingredients, and heated over a moderate fire. The appearance of the smoke from the oil or tallow, indicates the degree of heat. If the smoke just appear, the temper corresponds with that indicated by the straw color when the metal is heated alone. If so much heat

is applied that a black smoke arises, this points out a different degree of hardness; and so on till the vapor catches flame. By this method a number of pieces may be done at once, with comparatively little trouble, and the heat is also more equally applied.

"A still more accurate method of producing any desired degree of temper, is to immerse the steel in some fluid medium, the temperature of which is kept regulated by the thermometer. Thus oil which boils at about 600 degrees, may be used for this purpose at any degree of heat which is below that number of degrees. Mr. Parkes has recommended the employment of metallic baths, chiefly composed of lead and tin, in different proportions, which pass into fusion at definite temperatures, and which can be used for tempering steel, as soon as they arrive at their melting points.* †"

* The following table of metallic baths is given in Parkes' Chemical Essays, Appendix to Vol. ii.

No.	Edge tools to be tempered in the various Baths.	Composition. of the Bath.	Temper. Fahren.
1	Lancets, in a Bath composed of	7 lead 4 tin	420°
2	Other surgical instruments	7½ lead 4 tin	430
3	Razors, &c.	8 lead 4 tin	442
4	Penknives and some implements of surgery	8½ lead 4 tin	450
5	Larger penknives, scalpels, &c.	10 lead 4 tin	470
6	Scissors, shears, garden hoes, cold chisels, &c.	14 lead 4 tin	490
7	Axes, firmer chisels, plane irons, pocket knives, &c.	19 lead 4 tin	509
8	Table knives, large shears, &c.	30 lead 4 tin	530
9	Swords, watch springs, &c.	48 lead 4 tin	550
10	Large springs, daggers, augers, small fine saws, &c.	50 lead 2 tin	558
11	Pit saws, hand saws, and some particular springs	Boiling linseed oil	600
12	Articles which require to be still somewhat softer	Melting lead,	612

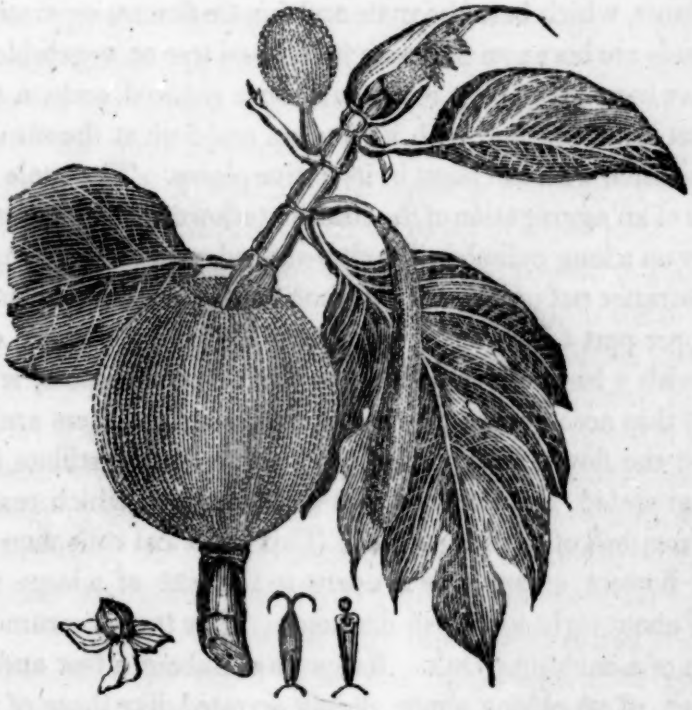
† Formerly, no man in Great Britain knew how to temper a sword in such a way that it would bend for the point to touch the heel and spring back again uninjured, except one Andrew Ferara, who rsided in the Highlands of Scotland. The demand which this man had for his swords was so great, that he employed workmen to forge them, and spent all his own time in tempering them; and found it necessary, even in the day time, to work in a dark cellar, that he might be better able to observe the progress of the heat, and that the darkness of his work shop might favor him in the nicety of the operation.

The swords, which were formerly in the highest repute, were made at Damascus in Syria. The method by which these were made, has long been lost, or perhaps it was

NATURAL HISTORY.

THE BREAD FRUIT.

Artocarpus incisa.



The Bread fruit tree is a native of the Molucca and South Sea Islands, and the many uses to which it is applied renders it the most valuable of the vegetable productions of those latitudes.

never thoroughly known to Europeans; but from their striated appearance, it has been supposed that they were formed by alternate layers of extremely thin plates of iron and steel, bound together with iron wire, and then firmly cemented together by welding. These weapons never broke, even in the hardest conflict, and retained so powerful an edge, as to be capable of cutting through armor. Various other explanations have been given in regard to the character and structure of the Damascus, or damasked, steel.

The inhabitants derive from it the principal part of their food, and its importance is much enhanced by the great duration of its fruit, which will remain on the tree eight months of the year. Other parts of the tree contribute to various purposes of utility or convenience which the simple wants of the natives of those countries require. Clothing is made by them of the inner bark of the tree; the wood is useful for constructing boats or dwelling houses, the leaves serve for coverings of the roof, and for wrappers; the male catkins or aments make a good material for tinder, and the juice which exudes from it possesses a viscidity which is serviceable for birdlime. The Bread fruit belongs to the Linnean class of monœcious plants, which bear the male and female flowers separately, but both kinds are borne on the same individual tree or vegetable. The figure we have given of it represents, on a reduced scale, a twig of the plant infull bearing, with its flowers and fruit at the same time, as is common with the plant in its native places. The male catkin consists of an aggregation of the staminate flowers which are crowded together on a long cylindrical or club-shaped receptacle, giving them an appearance not unlike the common cat-tail rush of our marshes. The upper part of the figure represents the young flowers, of both kinds, with a leaf, enveloped in the boat-shaped stipule, which is the leaf that accompanies the flower, and which withers and drops off after the flower is expanded. The female or pistillate flowers are aggregated likewise, but in a globular head which resembles the *button ball* of our Plane tree. This spherical collection of the female flowers enlarges as it ripens to the size of a large melon, usually about eight inches in diameter. The tree is commonly of the size of a middling Oak. Its leaves are about a foot and a half in length, of an oblong shape, deeply serrated, like those of the fig tree, which they resemble in color and consistence and in the white, milky juice which exudes from them on being broken.

The Bread-fruit is usually gathered before it is ripe, as it is then in its best state for use. While it is green and hard it is baked in an oven until the rind is scorched, which is scraped off, and the interior part between the core and the skin, is then soft, tender, and white, like a loaf of wheat bread. It must be eaten when recently baked, as if kept until it is stale it becomes hard and choaky. It

is of a pleasant taste, but, according to European accounts, rather insipid. Commodore Anson describes it as similar to the potato in flavor, and as eagerly sought after by his crew; when ripe it was very pleasant in its raw state, and mixed with lime or orange juice makes an agreeable tart not unlike apple sauce.

The valuable properties of this tree, and its great importance in the climates of which it is a native, recommended it long ago to the English government, as a fit subject to be introduced into their West India Colonies; accordingly an expedition was fitted out by them, in 1787, for the purpose of procuring the plants and transporting them into the different Islands of tropical America. A vessel called the Bounty was equipped, under the command of Lieutenant Bligh, a skilful officer, who had accompanied Captain Cook in his last voyage, and sailed to Otaheite, one of the Society Islands. He there obtained a large number of the young plants, upwards of 1000 of which were carefully disposed in boxes and tubs, and every precaution taken to preserve their health during transportation, and insure the success of the project. The unfortunate failure, however, of this expedition, owing to the mutiny of the crew and the perils and misfortunes which Lieutenant Bligh, and the few who remained faithful to him, experienced in a voyage in an open boat, 1200 leagues over the ocean, are still remembered with interest in England, and are intimately associated with the history of the Bread fruit. The British government, through the influence of Sir Joseph Banks, resolved on another attempt to accomplish the desired object, and Capt. Bligh proceeded again, in 1791, to Otaheite. His efforts were this time crowned with complete success. He sailed from that Island with 1281 plants, in pots and tubs, and arrived with the greatest part of them in a healthy condition at the Islands of St. Vincents and Jamaica, where they were landed, and from these places the plants, which are now cultivated in various other Islands of the West Indies and parts of equinoctial America, have been supplied.

Notwithstanding the pains and difficulties encountered in this highly laudable enterprize, in thus distributing the bounties of nature in other climates than those to which she has confined them, the culture of the Bread fruit has not been found to repay the cost

of its introduction, when its value is compared to that of some of the native plants of those latitudes. The Artocarpus is a slow growing tree, requiring many years to bring it to maturity, and the mode of propagation requires greater care and attention than are willingly bestowed by the laborers of those regions. In these respects it is inferior to theP lantain tree (*musa paradisiaca*) which is of very rapid growth, and yields its fruit in about fifteen months after setting the sucker; this fruit is more abundant and contains a greater quantity proportionally of nutritive matter, and is more palatable to the Negroes and other inhabitants, who were expected to make use of it. Many other fruits also obtain the preference over the Bread fruit, which is usually condemned by the inhabitants, or strangers who visit those pla ces, for its insipidity when compared to the native or commonly cultivated fruits of its adopted country.

THE PORCUPINE.

Hystrix dorsata.

The little animals which pass by this name, and which in form and habit closely resemble each other, although specifically distinct, are found in all the quarters of the globe. They are remarkable for the peculiar kind of quills or spines with which they are provided, and which serve as the means of defence, as well as for the purpose of warm covering. The Porcupine was known to the ancients, and the well known fable has originated with them which represents him as endowed with the power of darting his quills to a great distance in assailing his enemies.* This account we know to be altogether unfounded, yet it is not improbable that the ease with which they enter an opposing body, and the effects produced by a wound from these sharp pointed instruments, might give rise to the supposition of some missile force being required to render their lodgment so certain and effective. As they are in reality, they

* Hystrices generat India et Africa spina contectas, ac herinaceorum genere: sed hystrici longiore aculei, et cum intendit cutem, missiles.—*Pliny Nat. Hist.* 8*th.* c. 53.

answer the end of the most effectual means of defensive warfare. They cover the back of the animal, who, when it is threatened, curves itself up in the form of a ball, presenting these erect, stiffened, and acute points, which are impenetrable and intangible by the strongest antagonist. The ends of these points, when closely examined, are found to be furnished with minute prickles or barbs pointing backwards, like a fish hook, so as to be capable of easily entering any soft substance. After entrance they are prevented from receding, by the barbs, which erect themselves, and resist any attempt to withdraw them. No sooner have they penetrated the surface, than they tend to push forward, and gradually bury themselves in the flesh of the creature that comes into contact with them, and generally prove fatal by transpiercing some vital organ. Our American species is found in the northern part of the Union, and differs in a few particulars from the European species, though it corresponds with that in habit. The Indian dogs, it is said, sometimes rashly attack, and attempt to worry the Porcupine, unmindful of his formidable armour; an attack from which the most fatal consequences ensue. The spines are easily detached from the skin of the animal, and fill the mouth of the dog; and nothing can prevent the deadly effects of them but a speedy removal of them, as is done by the Indian women, who carefully extract them. Wolves are also known to receive their death from the same cause.

The Porcupine is a small quadruped of slugglish habits and feeble nature. Hearne, who observed them in their native places, remarks that "they travel so slowly that the Indians going with packets from fort to fort, often see them on the trees; but not having occasion for them at the time, leave them until their return, and should their absence be a week or ten days, they are sure to find them within a mile of the place where they had seen them before."

MERCURY.

BY DR. L. FEUCHTWANGER.

Mercury or Quicksilver; *Hydrargyrum*—Latin; *Argent vif*—French.

This metal occurs, in its native state, in a variety of forms:—1. either pure, or as an amalgam with silver; 2. with chlorine, in the mercurial Horn ore; 3, with sulphur, in the Cinnabar, in a darker or lighter color; and 4. as a carbo-sulphuret, in the mercurial coral ore. It is usually found in the state of a sulphuret, from which, and from the mercurial coral ore, it is obtained by distillation. In this process, the richer ores are placed in their natural state in the furnace, those which are not so rich are broken, levigated, and mixed with lime, if it happens that their gangue is destitute of that mineral. The furnace consists of a fire place, and above it three different partitions, each forming a department. On the first of these divisions the large and coarse pieces of the mercurial ore are placed, so that the flame can penetrate every where around them; on the second and third divisions, round flat dishes, filled with layers of the ore, are placed. On the right and left side of the furnace, chambers are successively arranged, to the number of seven, which serve as receivers; the first of which communicates with the upper department of the furnace, through a canal, and the other chambers communicate alternately from above and below; the seventh chamber communicates with the atmospheric air. After the ores are properly arranged and luted, the fire is made, and the flames pass through the three departments, and operate on the massive ores, as well as the dishes which contain the powdered ore.

In this high temperature, the sulphur of the Cinnabar combines with the lime, and forms the hepar; one part combines with the oxygen of the lime, and developes the other part as sulphurous acid, or forms with another part of the lime, gypsum. The mercury, which is now liberated from the sulphur, goes off in vapour, which, cooling in the different chambers, is condensed into running quicksilver, while the gases and some vapors are escaping in the atmospheric air. The mercury prepared in this manner is not

quite pure. In order to purify it, it is necessary to distil it over from a glass or earthen retort, or, to procure it as pure as possible, to distil Cinnabar with lime and iron filings; or another way is to decompose corrosive sublimate by potash, and distil the precipitate.

Mercury is the only metal which retains its fluidity at the common temperature of the atmosphere, but becomes solid at forty degrees below zero of Fahrenheit, and is then malleable. Its specific gravity, in its fluid state, is 13,5, but when congealed, it is 15,6, and more. Its density increases in its solid state so much that one cubic foot weighs 1093 lbs., while the same bulk of fluid mercury weighs 950 lbs. Mercury boils at nearly 660 degrees of Fahrenheit.

Native mercury is always found in small globules in almost all the mines which yield cinnabar or the coral ore. In a geological view, it belongs to the Bitumenous Schiste, (argillaceous slate) sand stone, and compact lime stone. It is often found also accompanying iron pyrites, galena, antimony, &c. The localities of the native mercury, the amalgam, (combination of mercury with silver) the sulphuret of mercury, (cinnabar) or the coral ore, are not very numerous. The most important mines are found in Spain, in Austria, and in Peru. The oldest mine is that of Almadar, in Spain, being known to the ancients, and referred to by Pliny, who speaks of the mines of Sisapone, in Bœtica, a province of ancient Spain.

Idria and Moschellandsberg produce a considerable quantity. It is said that there are extensive mines in China and Japan.

The various purposes in the arts, in medicine, and in its scientific application to the experiments of natural philosophy and chemistry, are not less numerous than important. Our Barometers and Thermometers, those two invaluable instruments by which accuracy is insured in many important objects of research, it is well known, are constructed of this metal. Medical science is largely indebted to it for some of the most powerful preparations, and some of the most deleterious are also derived from it. It is well known that millions of the human race have proved the efficacy of calomel, which is a combination of mercury and chlorine; and that most active poison, corrosive sublimate, is a higher com-

bination of the same constituents. United with oxygen, it forms a black protoxide, and a red oxide, (red precipitate) and a black and red sulphuret, (œthiops mineral and cinnabar.) The Prussiate of mercury is formed by its union with Prussic acid.

Mercury forms the basis of many important materials in the arts. It is used for extracting silver and gold from their ores, by amalgamation. The amalgam of mercury and tin is extensively employed for silvering looking glasses, and cinnabar or the red sulphuret of mercury furnishes the brilliant pigment known by the name of vermilion.

Of late years a powder has been prepared from this metal which has become of great importance in the use of fire arms. The fulminating mercury is employed as an effectual substitute for flints for muskets and fowling pieces, or percussion guns. This powder detonates with a vehement and destructive force when rubbed or beat, when excited by the electric spark, on being heated to 300 degrees Fahrenheit, or by a drop of sulphuric acid. It is prepared by dissolving mercury in nitric acid, and by adding to the solution spirits of wine, which mixture must be heated in a water bath until it assumes a chrystalline form like small needles.

The following receipt for producing a fulminating powder, is the result of my own experience : 100 grains of mercury are dissolved in 250 grains of nitric acid, of 1.305 specific gravity, by a gentle heat, and afterwards two ounces of alcohol are added to the solution. This mixture is then heated until thick vapors arise. The chrystals which form of a silky lustre are to be dried carefully, and the fulminating mercury is then fit for all its purposes.

The cinnabar has been stated as the material from whence vermilion is obtained. There is a large manufactory of vermilion and cinnabar at Idria, where 100,000 lbs. of cinnabar are made of quicksilver and sulphur, in the following manner : Forty-two pounds of quicksilver are triturated with eight pounds of sulphur in a cask, by means of water power. In this state it is suffered to remain two hours, when the whole forms a black mass, which is the œthiops mineral, and no trace of the metalic fluid mercury remains. It is then put into a cast iron retort, and subjected to a process of distillation, which is tedious and sometimes dangerous,

since the evolution of sulphuret of hydrogen causes an explosion. Lump cinnabar is subliming, and from 600 lbs. of the œthiops mineral, 560 pounds of cinnabar can be obtained, which undergo a second sublimation. The vermilion is prepared from the cinnabar, by boiling it with caustic potash, in iron vessels, and with the same fluid digested with it for twenty-four hours.

HORTICULTURE.

Hyacinths and Tulips.

At this season of the year the principal beauties which enliven our borders and parterres, are the hyacinths and tulips. It is not possible to describe in words the splendor which a bed of these flowers exhibits when in full bloom; nothing less than actual inspection can convey any adequate idea of their surpassing brilliancy and richness. In every country where horticulture is an object of attention, these elegant flowers are universal favorites, and the general demand for them is a constant stimulus to the exertions of the gardeners to produce new varieties, and hence almost every year a new succession is added to the catalogues. We are accustomed to look to Europe for our choicest kinds, and those which are there considered as the finest sorts, meet with the same regard among us.

The most approved mode of culture, and the manner of treating bulbs generally, have been briefly and clearly stated by Mr. Prince, in his Treatise on Horticulture; the following account is drawn up from that work:

Situation. A southern aspect, dry and airy, and sheltered from the north winds, is preferable for most bulbs, but anemones and ranunculuses will do best in a situation combining a southern aspect, and is at the same time sheltered from the intense heat of a noon-day sun.

Soil. One-third common sand, one-third old well rotted cow yard manure, and one-third good garden mould; let the beds thus

formed, be well pulverized to the depth of eighteen or twenty inches, that the three component parts may be completely mixed together; a fourth part of rotten wood, or decomposed vegetable mould from a wood or swamp, if convenient to be had, may be added with advantage to the above, and will at all times be beneficial in giving additional lightness to the soil; and when thus prepared, the soil need not be removed for five or six years. The beds should be raised from four to six inches above the level of the walks, and moderately arched, which will give an opportunity for all superfluous moisture to run off; some sand strewed in the trenches, both before and after placing the roots, would be of advantage.

Time of Planting. For hyacinths, tulips, crown imperials, lilies, polyanthus narcissus, common narcissus, jonquils, irises, crocuses, colchicums, star of Bethlehem, winter aconites, snowdrops, snowflakes, gladiolus, and most other hardy bulbs, the preferable season for transplanting, is the months of August, September, and October; and it would be well here to observe, that the above mentioned bulbs (tulips excepted) will thrive best if not taken from the ground oftener than every second or third year.

The different species of ferraria, antholyza, ixia, crinum, and Hæmanthus, the tender kinds of Amaryllis, pancratium, and gladiolus, with most other delicate bulbs, may be planted during the months of November or December in pots, when intended to be sheltered during winter, or they can be kept in dry sand until the months of March or April, and then be planted in the open ground when it has become free from frost and perfectly settled.

Depths and Distances. Hyacinths, martagon, and other lilies and pæonies, should be planted at a depth of four inches; crown imperials, and polyanthus narcissus, six inches; tulips, double and single narcissus, jonquils, colchicums, and snowflakes, three inches; bulbous irises, crocuses, arems, small fritillaries, pancratium, gladiolus, and snowdrops, two inches; ranunculuses, anemones, and dog's-tooth violets, one inch; always measuring from the top of the bulb. The rows should be about ten inches apart, and the roots placed from four to six inches apart in the rows, according to their size.

Protection during winter. On the approach of winter, it would be beneficial to cover the beds with tanner's bark, withered leaves, or light rotten earth from the woods, such as is formed by the decay of leaves, to the depth of two or three inches, as it prevents any ill effects, which a very severe season might have on the roots; but it should be carefully raked off again early in the spring.

Taking up bulbs after blooming. The only advantage to be gained by taking up hyacinths and other bulbs, (tulips excepted,) is either to revive the roots when they have become too numerous, or to renew a worn-out soil, neither of which can occur oftener than once in three years; with tulips, however, it is different; for as the fine and delicate tints they possess do not originate with the rearing of the plant, but are the result of art practised in their after cultivation, and as variations of color thus produced are rather the effect of disease in the plant, than of any other cause, it is necessary to continue the course of annually taking up the roots of all the finer varieties, in order to preserve their beauties in perfection. Tulips may be kept from the ground two weeks or more at the option of the owner; but hyacinths and other roots it is preferable to plant as soon as they are separated, and a fresh bed prepared according to directions already given.

About a month after the bloom is passed, the foliage puts on a yellow decayed appearance. This is the proper season for taking them up; on doing which, you must cut off the stem and foliage within an inch of the bulb, leaving the fibrous roots attached to it. After thus preparing them, they must be spread singly in an airy room for two or three weeks to dry, and then each root must be wrapped carefully in paper, or put in dry sand until replanted.

Hyacinths and other bulbs to bloom in pots or glasses. For this purpose single hyacinths, and such as are designated as earliest among the double, are to be preferred. Double and single jonquils, polyanthus, narcissus, and double narcissus, also make a fine appearance during the winter season.

Bulbs intended for blooming in pots during the winter, should be planted in the months of October and November, and be left exposed to the open air until it begins to freeze, and then be

placed in the green house, or in a warm room. They will need moderate occasional waterings, and should be exposed as much as possible to the sun and light, to prevent the leaves from growing too long, or becoming yellow.

Those intended for glasses should be placed in them about the middle of November, the glasses being previously filled with pure water, so that the bottom of the bulb may touch the water, then place them for the first ten days in a dark room, to promote the shooting of the roots, after which, expose them to the light and sun as much as possible; the water should be changed as often as it becomes impure, and care be taken not to suffer it to freeze.

Tulip—Tulipa gesneriana. In no class of plants has nature so varied her delicate tints as in this; it would seem as if each change which nature or art is capable of forming, was included in the varying beauties of the tulip, above one thousand one hundred varieties of which are cultivated in some of the gardens of Holland. All the finer varieties, however, of this delightful flower, have been obtained by cultivation and art during the last two centuries, through the perseverance of the Dutch, French, and Flemish florists; several kinds of which possess a delightful fragrance, although persons who are ignorant of this circumstance, have made the want of it an objection to this splendid flower. About the middle of the 17th century, the rage for the tulip was so great in Holland, that from four to twenty-five thousand florins were given for a single root. The tulip called Semper Augustus, was sold for ten thousand florins, ($4,000,) and the one called Viceroi, for twenty-five thousand florins, ($10,000.) This extraordinary traffic was, however, soon checked by the interference of the legislature, who enacted that no tulip, or other flower, should be in future sold for a sum exceeding fifty guineas; and so effectual has been this law, that at present the highest price of any tulip in that country is only one hundred and fifty florins, ($60,) and the highest priced lily about the same sum. Tulips are divided into early and late blowers; the former begin blooming about the 15th of April, and are followed by the latter kinds in succession until the end of May; the late kinds produce the largest flowers, the stems of which are generally from twenty to thirty inches in height.

Hyacinths—Hyacinthus Orientalis. This favorite flower, which, with its great beauty, combines also the most exquisite fragrance, has been cultivated in Holland to an equal extent with the tulip, and one thousand three hundred varieties are found in the gardens of that country. The first double hyacinth known in Holland, was raised from seed about the end of the 17th century, by Peter Voorhelm, from which all the fine double varieties we now possesss may be traced. So great was the value of a fine double hyacinth formerly in Holland, that from two to ten thousand florins were given for a single root; and Mr. Dutens mentions that, in his travels in that country in 1771, he saw ten thousand florins ($4,000) refused for a single bulb. So extensive has their cultivation, however, now become, that many acres are occupied by individuals solely for that purpose, and many hundred thousand roots are annually exported to other countries; and the prices have been so reduced that no hyacinths are sold at more than one hundred florins each, and few higher than from two to five guineas, and by far the greater number at much less rates. Single hyacinths are held in less estimation than double ones; their colors, however, are more vivid, and their bells, though smaller, are more numerous; they are preferable, for flowering in winter, to most of the double ones, as they bloom two or three weeks earlier.

It has been supposed by many that hyacinths, tulips, and other bulbous flowers, are difficult of culture, and that our country being unfavorable to their growth, they would dwindle and decline after a few years' cultivation. This is altogether a mistaken impression; and, if it ever occurs, must be owing to improper treatment, as no country in the world possesses a climate more congenial to the culture of bulbous flowers than the middle States; for the disadvantages of great fogs and a humid atmosphere, which are so much complained of by the Dutch as appertaining to their climate, do not exist in ours. The great ascendancy which Holland has ever held in the culture of bulbous flowers is the result of its soil, which is of peculiar formation, being a combination of marine sand made fresh by cultivation and bog mould; the proper means, therefore, to succeed equally in their culture, is to form a soil as near as

possible of the same component parts, which is by no means a difficult task. And, in fact, after all that has been said and written on the particular cultivation of bulbous roots, we often see the finest flowers in gardens where little or no attention is paid to them; and perhaps there is no class of plants which affords us so many delights, and so richly repays us for each little care bestow-stowed on them.

It may be well to remark that the bulbs which are frequently sent out on consignment to this country from Holland, and sold at our auctions, are the mere refuse, and such as are held in no esteem either by amateurs or connoisseurs, and no idea can be formed by them of the beauty of the more estimable kinds; and it is to be regretted that our citizens should have been so often duped in their purchases of these roots, under the imposition of high sounding names.

MISCELLANY.

LANGUAGE.

For the Magazine of Useful Knowledge.

It has been a query with some, whether language is of Divine, or human, origin; but we consider the fact that artificial aid or means are necessary to preserve or perfect any language, as sufficient proof, that although the faculties and organs of speech are the gift of a kind Creator, yet the formation of all language is the work of man himself, or rather perhaps the result of accident or necessity.

It has moreover been a query what could have been the language in which the Deity communicated with man in the early periods of his existence; whether in Hebrew, Chaldaic, or one that may now be lost. If we set aside sacred history and divine revelation, and appeal to unassisted reason, we shall most assuredly arrive at the conclusion that the only language used by the

Creator, when condescending to communicate with man, was that of nature; and that this was originally the universal language of man in the primitive stages of his existence. Our most reasonable conclusions, drawn from all history, are, that mankind were originally savages, without any uniform system of articulation or vocal language; but that in process of time they made some progress in the formation of a language different from, or rather in addition to the language of nature, which consisted of sounds varied by modulations, gestures, or signs, changes of countenance, &c. &c. Were language originally of Divine origin, it would have been the same in the mouths of the whole family of man, and any two individuals, however remote they might have lived from each other, even separated by oceans and continents, would, on meeting, have been as well able to converse with each other as if they had been nursed and reared by the same mother and had never been separated; but this we know has never been the case; on the contrary, no country has ever yet been discovered at any considerable distance from any other, whose inhabitants spoke an already known language, or could be understood by the inhabitant of any other country.

Had the art of printing been discovered simultaneously with the formation of the first spoken language, (could such a thing have been possible) we have every reason to believe that there would have been no division of language within the circle of its influence.

It cannot be denied that every nation or tribe of the human race have had an equal opportunity of forming for themselves a language expressive, intelligible, and perfect, according to their abilities and ingenuity; and if our nation has a language less expressive, or less perfect than an other, it must be imputed to their want of abilities, ingenuity, or refinement. Will the people of this country admit themselves inferior in these respects, to those of any other people? if not, why should they continue to look upon the acquisition of the dead languages as an essential part of education?*

We admit that the English language is comparatively a new

* We take the liberty of referring our correspondent to the first article in this number, under the head of "Education," for a few arguments in answer to his query.—[Ed.

one, formed principally since the Christian era, and derived in a great measure from other languages; but if we have gathered all that can be of any use to us from the Hebrew, Greek, and Latin, it seems to be an unnecessary waste of time to devote so much of it as is now done in our academies and colleges to their acquisition—time that might be more profitably applied in refining and polishing our own language. But it is argued by the advocates of Latin, Greek, &c. that the study of these languages assists the scholar to obtain a more thorough and critical knowledge of our own, and also to acquire a purer and more chaste style. In this opinion the writer cannot concur, and he can cite many instances that would seem to prove the contrary to be the fact. Sir Francis Bacon, it is well known, wrote most of his works in Latin; but his English wanted both harmony and perspicuity, and was in many respects much inferior in style to that of some of his cotemporaries who knew little or nothing of Latin. Where, we would ask, can be found a more perfect style than in the writings of our illustrious countrymen Franklin and Washington? And yet we do not believe they could either of them write, or even translate the simplest sentence in any one of the dead languages. We admit the propriety of teachers in our higher seminaries of learning, and those who design to follow any one of the learned professions, acquiring a knowledge of the dead languages; though we are inclined to the opinion that a portion of those who crowd the professions, particularly that of law, might be more usefully employed in following the plough, than in getting a smattering knowledge of Latin and Greek, the only use of which they ever afterwards make, is to confound some well meaning magistrate more ignorant than themselves, and thus pervert the streams of justice.

It should be borne in mind that "time is money," which is emphatically true in regard to the laboring and business classes of mankind, and that time being lost to them, is lost to the whole community, who are dependant on them for both the conveniencies and luxuries of life. Any improvement, therefore, in the modes of education, which shall serve to economize time, would be a real benefit to the community at large; to do this, we know of no better plan than to confine children to such branches of edu-

cation as will be necessary and useful to them in the business which they are to follow in after life, and not allow them to waste their time in studies that will never be of use to them.

We have seen the suggestion in some papers, that our academies and colleges ought to be free to *all*, that all might have the benefit of a classical education. Were this to take place, our country would soon be destitute of laboring and business men, and inundated with professional men and scholars; the consequences of this state of things would soon be exhibited in the decline of business and the prosperity of our country. Those who are intended for tradesmen, &c. should be put to the business they are to follow in early life, if they would acquire any attachment to their business, or any degree of perfection in it. Those whose earlier years are spent in comparative ease or idleness, seldom turn out to be either good mechanics or industrious men. We are inclined to the opinion, that access to our academies and colleges is easy and cheap enough, and that our common schools are also cheap enough. All that is wanting is improvement in the teachers, and a more judicious adaptation of studies to the future business of the boy. OBSERVER.

HINDOO ASTROLOGY.

It is only a resident and close observer who can imagine what a baneful influence prevails over the Eastern world, and especially throughout Bengal, by means of astrology; witness on the Annual Almanac, formerly written, but now regularly *printed* at the Native Press, in Calcutta. Referring to the moon and stars, as the ruling powers of the year over the vegetable and animal creation, the seas, the clouds, and solar rays, we have minute predictions as to wind and rain—as to cold and heat—as to corn and herbage—as to the increase and decrease of the inhabitants—the increase and decrease of property—as to the diseases which are to ensue, and their cures—auspicious and unlucky days, &c. Were this production regarded only with a smile—did it awake no no-

tice, or excite no dread, it would be unworthy of remark; but the case is far otherwise. The Diverjras, a regular order of astrologers, with one of these almanacks under their arm, travel the country, invoking the sun and propitiating the planets for hire; while their prophecies are received with unwavering confidence by the poor natives. Even the opulent retain an astrologer, as they do a physician; and all important secular movements are under his regulation, for one verification is quite sufficient to cover ten failures, and the Hindoo still abides by their system of delusion and fraud.—*Miss. Register.*

SOLUTIONS TO MATHEMATICAL QUESTIONS.

[Proposed in our last.]

BY C. HARRIS, NEW-YORK.

1. A number consisting of two digits, which, when divided by the difference of those digits, gives a quotient equal to one quarter of itself; and if the number composed of the digits inverted, be divided by the sum of the digits, the quotient is equal to the difference of the digits, what is the number?

SOLUTION BY M. FLOY, JUN.

Let $10x+y$ denote the number.

Then $\frac{10x+y}{x-y}=\frac{10x+y}{4}$ and $\frac{10y+x}{x-y}=x-y$.

From the equation we have $x-y=4$,

Whence $\frac{10y+x}{x+y}=4$, or $10y+x=4x=4y$.

Or $3x=6y$ or $x=2y$. Hence we have $y=4$, $x=8$, and the number required is 84.

BY C. HARRIS.

2. Find the year in which the cycle of the sun will be one, the lunar cycle two, and the cycle of indiction three; also the year in which each of the cycles will be ten.

SOLUTION BY PELEG.

Let x represen the required year; then by the rules for determining the respective cycles, [See Vince's Astronomy, vol. 1, page 577] it appears that $\frac{(x+8)}{28}$, $\frac{(x-1)}{19}$ and $\frac{x-315}{15}$ must be whole numbers.

Put x=15a, and (x—1)÷19 or (15a—1)÷19=b, then a=(19b+1)÷15+=b+(4b+1)÷15=b+c, by assumption, or b=(15c—1)÷4=3c+(3c—1)÷4=3c+d; or c=(4d+1)÷3=d+(d+1)÷3=d+e; or d=3e—1. Hence c=(d+e)=4e—1; b=(3c+d)=15e—4, a=(b+c)=19e—5; and x=15a=285e—75, then (x+8)÷28 or (285e—67)÷28=10e—2+(5e—11)÷28 must by a whole number.

Let (5e—11)=28f; or e=(28f+11)÷5=5f+2+(3f+1)÷5=5f+2+g; or f=(5g—1)÷3=g+(2g—1)÷3=g+h; or g=[3h+1]÷2=h+1]÷h=k; or h=[2k—1]: whence restoring for the intermediate assumptions I have ultimately x=[285e—75]=7980k—2640, the least positive value of x, [when k=1] will be 5340; which is the year of the christian era, when the respective cycle will first be 1, 2, and 3.

2d, if x be assumed as above, I have to determine [x—1]÷28; [x—9]÷19; and [x—322]=15, or [x—7]÷15, whole numbers, putting x—1=28a, and assuming and reducing, &c. Progressively, as in the preceding, I determine x=7980e—4703; from which formula, if e=1, the x=3277; the year in which each of the proposed cycles will first be 10.

SOLUTION TO THE SAME BY M. FLOY.

Let x denote the year required: then $\frac{x+8}{28}$ $\frac{x-1}{19}$ and $\frac{x}{15}$ must be whole numbers. Now a general formula for solving questions of this nature is, 7980e—3135r+4200r′—1064r″; where e may be assumed at pleasure.

In the above example we have, r=—8. r′=1. r″=0. Whence x=7980c+15080+4200=7980c+29280. If c=3 then x=5340 year require using the general formula for the other example we find the year to be 3277.

BY M. FLOY, JUN. NEW-YORK.

3. Multiply 311 f., 4′, 7″, by 36 f., 7′, 5″, and give a general and easy method of solving questions of this nature.

SOLUTION BY THE PROPOSER.

Multiply 311f 4′ 7″ by 36f 7′ 5″. The most ready method of performing questions of this nature is, in my opinion, that given by Barlow in his "Theory of Numbers." Thus 311f 4′ 7″ is expressed in the duodenary scale of notation by 21e 47 (e being a symbol used to denote 11 d for 10) and 36f 7′ 5″ is expressed by 30.75. Now these being reduced to the duodenary scale, the multiplication may be effected as in common decimals,

only remembering to carry 1 for every 12, instead of 10, as in the common scale, thus:

21e.47	
30.75	
65*d*1.90	
131.781	
d.98*de*	
11402f 2′ 4″ 11‴ 11⁗=6722.24*ee*	

BY PRACTICE.

f311	4′	7″			
		6			
1868	3	6			
		6			
6′=½	11209	9	0		
1 =⅙	155	8	3	6	
4″=⅓	25	11	4	7	
1=¼	8	7	9	6	4
	2	1	11	4	7
f11402	2′	4″	11‴	11⁗	

To explain more particularly this method would require too much room. My design in proposing the queston was to induce those who want farther information to refer to Barlow, where every thing relating to the subject may be found.

BY SENEX, BROOKLYN.

4. Given $x + y = a$, and $x^5 + y^5 = b$, to find the value of x and y, by a simple equation.

SOLUTION BY M. FLOY.

Given $x+y=a$ and $x^5+y^5=b$. Put $xy=p$, then $x^5+y^5=a^5-5a^3p+5ap^2=b$, whence

$$p^2-a^2\ b=\frac{b-a^5}{5a}$$

$$\text{Or } p=\frac{a^2}{a}\pm\sqrt{\left\{\frac{a^4}{4}+\frac{b-a^5}{5a}\right\}}=f=xy.$$

Squaring, first, $x^2+2xy+y^2=a^2$

$$4xy \quad =4f.$$

By subtraction, $x^2-2ny+y^2=a^2-4f$

Or, $x-y=\sqrt{[a^2-4f]}$.

Hence we have $x=\frac{1}{2}a+\frac{1}{2}\sqrt{[a^2-4f]}$

$$y=\frac{1}{2}a-\frac{1}{2}\sqrt{[a^2-4f]}.$$

BY SENEX, BROOKLYN.

5. Given $x + y + z = 24$, $(x - y)-(x - z)= 6$, and the two least $y^2 + z^2 = 52$, to find the value of x, y, and z, by a simple equation.

SOLUTION CY MR HAMMOND.

$x+y+z=24$

$[x-y]-[y-z]=x-2\ y+z=6$

$y^2+z^2=52$

Subtracting the 2d eq. from the 1st and dividing the quotient by 3, we obtain $y=6$; then by the 3d, $z^2=16$, $z=4$ ∴ by the 1st $=x=24-6-4=14$.

BY SENEX, BROOKLYN.

6. Given $x^3 + y^3 = a$, and $xy(x + y) = b$, to find the value of x and y by simple equation.

SOLUTION BY MR. HAMMOND.

$x^3+y^3=a$, $x^2y+xy^2=b$. Adding three times the 2d to the 1st $x^3+3x^2y+3xy^2+y^3=a+3$ b. Extracting cube root $x+y=\sqrt[3]{[a+3b]}$. Dividing the 1st given equation by this last $x^2-xy+y^2=a\div\sqrt[3]{(a+36)}$, which put =c. Dividing also the second given equation by the same, we get $x\,y=b\div\sqrt[3]{(a+3b)}=d$. Extracting the root of the difference of these two, $x-y=\sqrt{(c-d)}$ $\therefore$ $x=\frac{1}{2}[\sqrt[3]{(a-3b)}+\sqrt{(c-d)}]$ and $y=\frac{1}{2}[\sqrt[3]{(a-3b)}-\sqrt{(c-d.)}]$

BY A. H. SANDS, NEW-YORK.

7. Given $43r^4 - 856r^3 + 1680r^2 - 827r = 44$, to find the four roots of the equation.

SOLUTION BY J. D. WILLIAMS.

Let $\left.\begin{array}{l} x^2+yz=a=16 \text{ or } 280 \\ y^2+xz=b=17 \text{ or } 290 \\ z^2+xy=c=18 \text{ or } 300 \end{array}\right\}$ to find the value of x, y and z.

Let us assume $x\div mz$, $y=nz$, then the equation becomes $z^2[m^2+n]=a$; $z^2[n^2+m]=b$; $z^2[1+mn]=c$. Multiplying the first of these equations crosswise into the second and third, I have $a+amn=cm^2+cn$; $an^2+am=bm^2+bn$. From the first I have $n=[cm^2-a]\div(am-c.)$ Substitutingt his value of n in the other equation, I have

$$\frac{a(cm^2-a)^2}{(am-c)^2} - \frac{b(cm^2-a)}{am-c} = bm^2-am.$$

Hence by reduction and transposition I have $(c^2-ab)m^4+(bc+a^2)m^3-4acm^2+(c^2+ab)m=bc-a^2$, and in numbers, $26m^4+281m^3-576m^2+298\,m=25$; or, 2d, by $44\,m^4+827\,m^3-1680\,m^2+856\,m=43$.

Otherwise, let $y=mx$, $z=nx$ and the n dividing the first equation by the second and third, I have $(1+mn)\div[m^2+n]=a\div b$ and $[1+mn]\div[n^2+m]=a\div c$. From this first I deduce $m=[an^2-c]\div[cn-a]$, and this value being substituted for m, in the former, I obtain by reduction and &, the final biquadratic equation, $[bc-a^2]n^4-[ba+c^2]n^3+4acn^2-[bc+a^2]n+ba-c^2=0$, or in numbers and reduced, $25n^4-298n^3+576n^2-281n=26$, or $43n^4-856n^3+1680n^2-827n=44$.

$$n\left\{\begin{array}{l} =1,283137 \\ =1,06049 \\ =9,65553 \\ =-,079154 \end{array}\right\} \quad \begin{array}{l} = 1,03506543 \\ = 1,1508968 \\ n=17,7693535 \\ = 0,0483390 \end{array}$$

$$\left.\begin{array}{l} x=2,525513 \\ y=2,969152 \\ z=3,240580 \end{array}\right\} \quad \begin{array}{l} x=11,168 \\ y=12,112 \\ z=12,835 \text{ nearly.} \end{array}$$

Given $43x^4-856x^3+1680x^2-827x=44$ to find the four roots.

Root, 17.76935

43			Root.	43			
— 856	1680	—827	44 (1,035	—856	1680	—827	44
43	—813	867	40	731	—2125	—7565	—142664
— 813	867	40	4	—125	—445	—8392	142708
43	—770	97	3, 52458	731	10302	167569	128111
— 770	97	137	47542	606	9857	159177	14597
43	—727	—19,514	46951	731	22729	23839	12608
— 727	—630	117,486	591	1337	32586	18301,6	1989
43	—20,48	—20,127	543	731	1469	2488	1914
— 685	—650,48	97,359	48	2068	3405,5	20780	75
1,3	—20,4	—3,458	45	30	149	223	64
— 682,7	—670,9	93,90,1	3	209,8	355,5	2101,3	11
1	—20	—3,46		3	15	22	11
— 68,1	—,69,1	,9,0,44		213	3,7,1	2124	
						3	
						2127	

43			Root.	43			Root.
— 856	1680	—827	44(1,150	—856	1680	—827	44(—'048
47,3	889,57	869,473	46,7203	—2	34,3	—68,57	35,8228
— 808,7	790,43	42,473	—2,7203	—858	1714,3	—895,47	8,1772
47,3	—837,54	—51,821	—2,6320	—2	34,4	—69,75	7,8387
— 761,4	—47,11	—9,348	—883	—8,6,0	1748,7	—965,52	3385
47,3	—785,51	—43,293	—7867		34,4	—14,32	2984
— 714,1	—832,62	—52,641	—963		1783,1	—9798,4	401
47,3	—33,23	—44,95	—892		7,0	—144	398
— 666,8	—865,85	—97,59	71		1790,1	—9942	3
22	—33,1	—75	69		7	—5	
— 664,6	—899,0	—983,4	2		1,7,9,7	—994,7	
4	—33	—8				—1	
—6,6,2	—9,3,2	—9,9,1				—99,5	

Hence the four roots are, $x \begin{cases} = 17,76935 \text{ or, } -04834, \text{ very near the truth.} \\ = 1,0350652 \text{ or, } +1,1508971, \text{ as required.} \end{cases}$

BY JOHN D. WILLIAMS, NEW-YORK.

10. Given $x^9 + 2x^8 + 3x^7 + 4x^6 + 5x^5 + 6x^4 + 7x^3 + 8x^2 + 9x = 987654321$, to find the value of x

SOLUTION BY THE PROPOSER.

2	3	4	5	6	7	8	9	987654321
9	99	918	8298	74727	672597	6053436	54430996	490329045
11	102	922	8303	74733	672604	6053444	54481005	497325276
9	180	2538	31140	354987	3867480	40860756	422227800	454711772
20	282	3460	39443	429720	4540084	46914200	476708805	42613504
9	261	4887	75123	1031094	13147326	159186690	172879440	34732607
29	543	8347	114566	1460814	17687410	206100890	64958824,5	7880897
9	342	7965	146808	2352366	34318620	40869739	20485676	7081181
38	885	16312	261374	3813180	52006030	24697063	85444501	799716
9	423	11772	252756	4627170	6379311	4568189	1387016	799473
47	1308	28084	514130	8440350	58385341	2926525,2	8683151,7	243
9	504	16308	399528	672951	687450	508582	140007	178
56	1812	44392	913658	9113301	652598,4	3435107	8823159	65
9	585	21573	47700	70742	73947	32433	28317	62
65	2397	65965	961358	98207,2	726545	346754,0	885147,6	3
9	666	2178	4925	7431	7940	3263	2836	3
74	3063	68143	101061	10563,8	80595	35001,7	887984	
9	59	222	509	780	488	328	319	
83	3122	703,6	1061,5	1134,4	8108,3	35330	88830,3	
	6	23	52	82	49	66	32	
	318	72,7	111,4	1216	815,7	3539,6	88862	
	6	2	5	5	5	6	....	
	324	7,5	1,17	1221	821	3546		
			5	...		...		
			122					
			..					

Root, x=9.748900273

☞Correct to the last figure, as some of our learned men may see without specks.

BY J. D. WILLIAMS.

11. Find 15 roots of the Binomial equation, $x^{15} - 1 = 0$.

SOLUTION BY THE PROPOSER.

Put $x^3=y$, then $y^5-1=0$. Now if a denote one of the imaginary roots of this equation, the roots are all contained in the expressions 1, a, a^2, a^3, a^4, or 1, a^3, a^6, a^9, a^{12}.

Now, $x^3-y=\left\{\begin{matrix} x^3-1 &=0 \\ x^3-a^3 &=0 \\ x^3-a^6 &=0 \\ x^3-a^9 &=0 \\ x^3-a^{12}&=0 \end{matrix}\right\}$ and if the values of x in the equation $x^3-1=0$ be denoted by 1, b, b^2, then the values of a, in $a^3-a=0$ will be a, ab, ab^2, and so on; hence all the fifteen roots of the given equation will be expressed as follows.

$$\left\{\begin{matrix} 1, & b, & b^2, \\ a, & ab, & ab^2, \\ a^2, & a^2b, & a^2b^2, \\ a^3, & a^3b, & a^3b^2, \\ a^4, & a^4b, & a^4b^2, \end{matrix}\right\} \text{Roots or values of, as required.}$$

Whence b, and b^2 are $-\frac{1}{2}\pm\frac{1}{2}\sqrt{-3}$, and thevalues of a, a^2, a^3, a^4, are contained in the expression, $\frac{1}{4}[(-\ |\ \pm\sqrt{5})\pm\sqrt{(-10\mp 2\sqrt{5})}]$. Corollary. It will readily appear from this that unity may have an indefinite number of roots besides itself. This is noticed by Bonycastle and Lacroix, in their works on algebra.

NEW QUESTIONS PROPOSED FOR SOLUTION.

BY J. SWINBURNN, BROOKLYN.

16. Required an algebraical solution of the following question, taken from Ryan's Diary.

If on a given base (886) of a plain triangle, between two acute angles, a semicircle be described, the circumference of which cuts the other two sides; and there be given the straight line joining the points of intersection (110), and the straight line bisecting the vertical angle and terminating in said line (68). It is required to determine the triangle.

17. Given $y^4-432+12xy^2$ and $y_2=12+2xy$, to find the values of x and y by a simple equation. (From Ryan's Algebra.)

BY M. FLOY, JUN. NEW-YORK,

18. Find a general expression for the perpendicular breadth of a river, given the base line on one side and the angles subtended by an object close to the other side.

19. Find three numbers whose sum may be a square, and such that if the square of the first be added to the second, the square of the second to the third, and the square of the third to the first, the sums may be squares.

BY J. D. WILLIAMS.

20. Given $x^4-38x^3+210x^2+538x=-289$ to find x by quadratics.

21. Find the least values of x and y in whole numbers that solve the equation, $x^2-940751y^2=1$.

22. Given $\sqrt[3]{[x^3+4x^2]}+\sqrt{[20x^2-10x]}=28$, to find the value of x without using any formula or method by approximation.

23. Given the diameters of three opaqe spherical bodies, equal 35, 40, and 45 feet recpectively, at 150, 160, and 170 feet distance from one another. Required, at what distance from each ball, a luminous spherical body, whose diameter is 10 feet, may be so placed as to enlighten the most surface of the other 3, when all their centres lie in the same horizontal plane.